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THIRD SERIES FOUNDED BY EDWARD JACKSON

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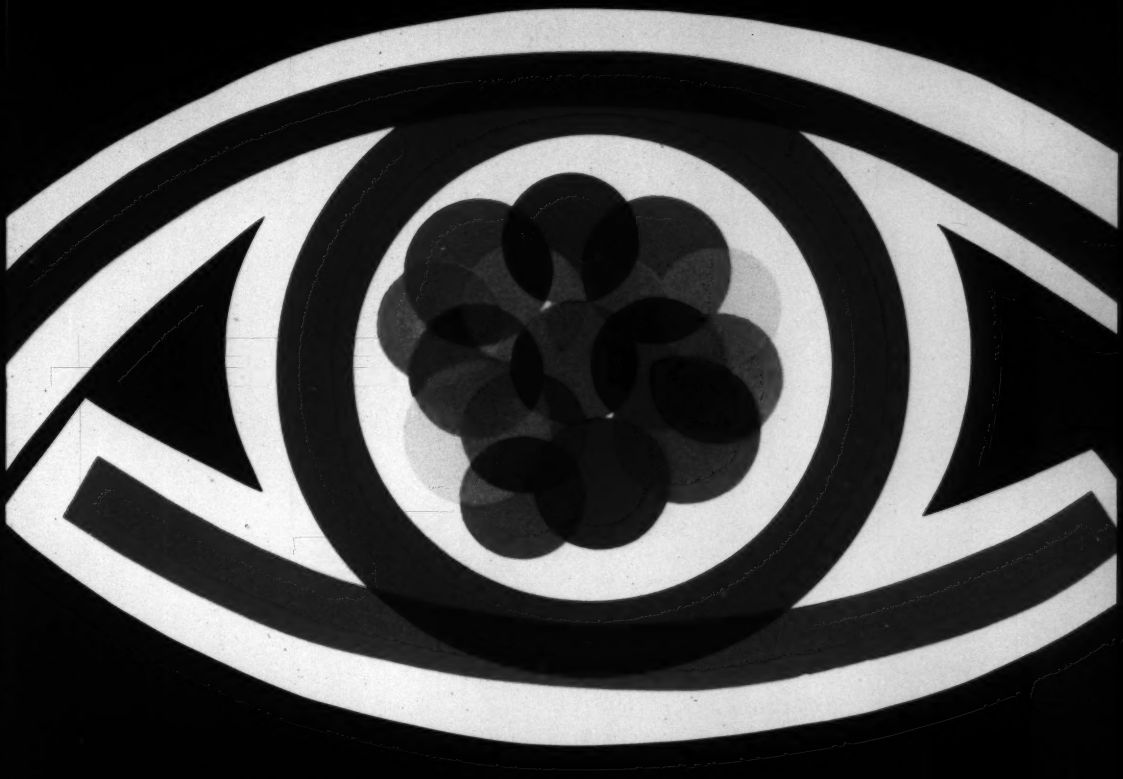

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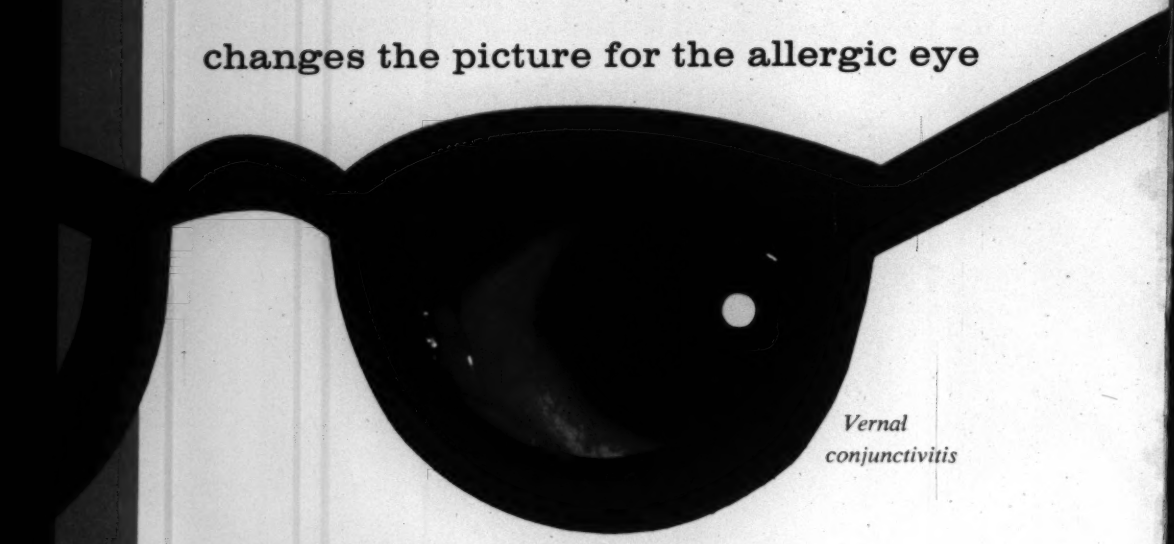

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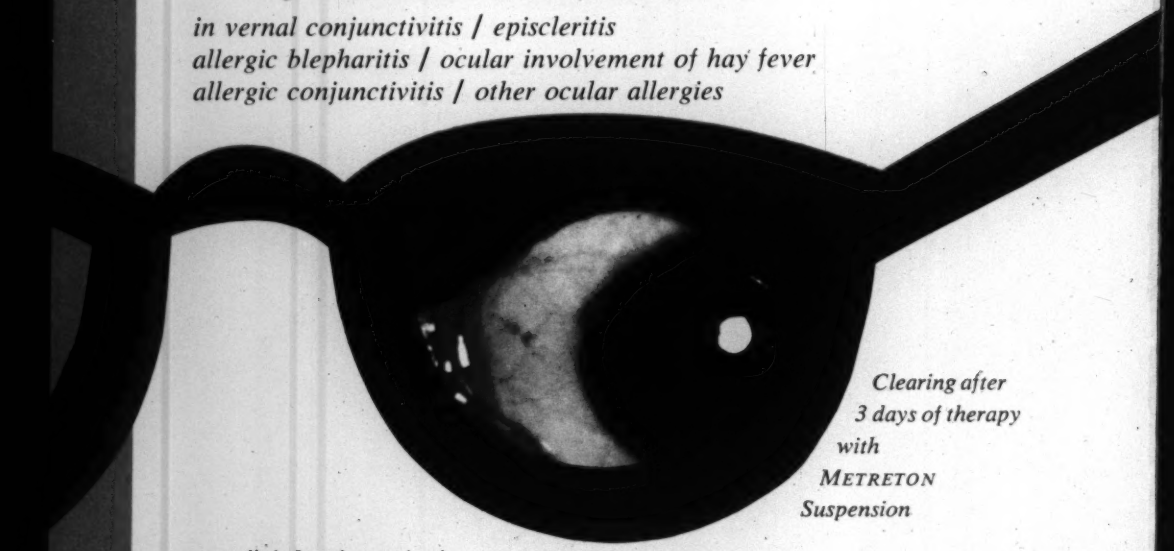

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1. Gordon, D. M.: Scientific Exhibit, American Medical Association, Annual Meeting, San Francisco, 1958.

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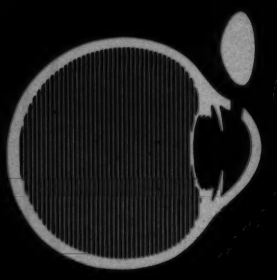

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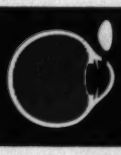
[1]Girard, Louis J., and Neely, Wanda: "The Evaluation of Zolyse in Cataract Extraction", Research Report No. 11, Alcon Laboratories, Inc., 1959.

[2]Boyd, Benjamin F.: Enzymatic Zonulysis, Highlights of Ophth., vol. III, no. 4, pg. 70, 1959.



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*Hirsch, H. A., and Finland, M.: *New England J. Med.* 260:1099 (May 28) 1959.

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References: Leopold, I. H., et al.: A.M.A. Arch. Ophth. *58*, 363 (1957); Krishna, N. & Leopold, I. H.: ibid., *62*, 300 (1959); Krishna, N. Leopold, I. H. & Lehman, R. A., Effects of Anticholinesterase Agents on the Blood Cholinesterase Levels of Normal and Glaucoma Subjects: Am. Ophth. Soc., Hot Springs, May 29, 1959; Becker, Bernard, et al.: Am. J. Ophth. *47*, 635 (1959); ibid., *48*, 313 (1959); Lawlor, R. C. & Lee, P. F., Use of Phospholine Iodide in the Treatment of Glaucoma: N.E. Ophth. Soc., Boston, April 16, 1958; Seward, W. J. & Albert, D. G., Use of Phospholine Iodide in the Treatment of Glaucoma: Episcopal Hospital, Washington, May 3, 1958; Drance, S. M., Effects of Phospholine Iodide on the Intraocular Pressure in Man: Univ. Saskatchewan, AMA Arch. Ophth., in press; Miller, J. E., Comparative Study of Miotics in Accommodative Esotropia: Washington Univ., St. Louis: Am. J. Ophth., in press; Giardini, A. et al., Sul Trattamento del Glaucoma Mediante Phospholine Iodide: Boll. d'Oculista, in press.

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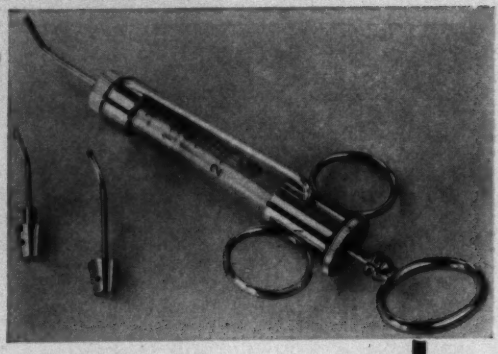

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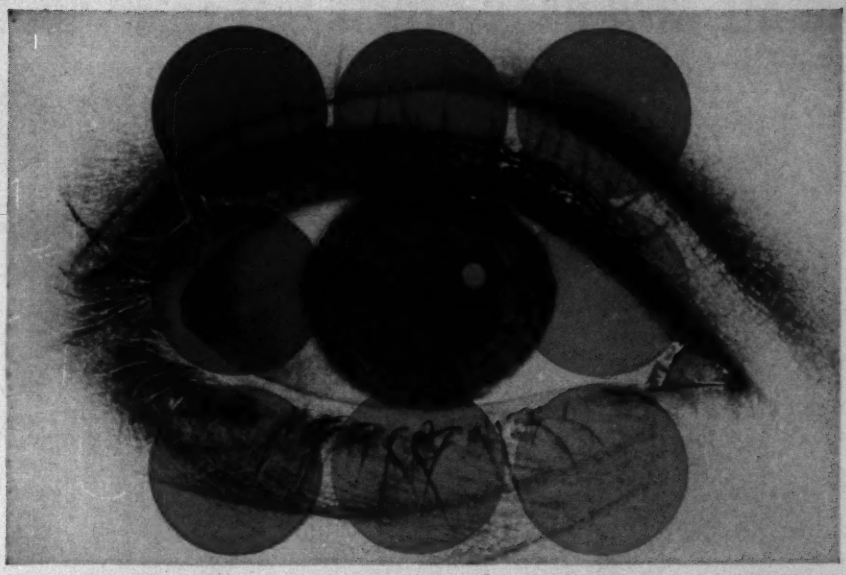

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1. New and Nonofficial Drugs: J. B. Lippincott Company, Philadelphia, 1958, p. 243.

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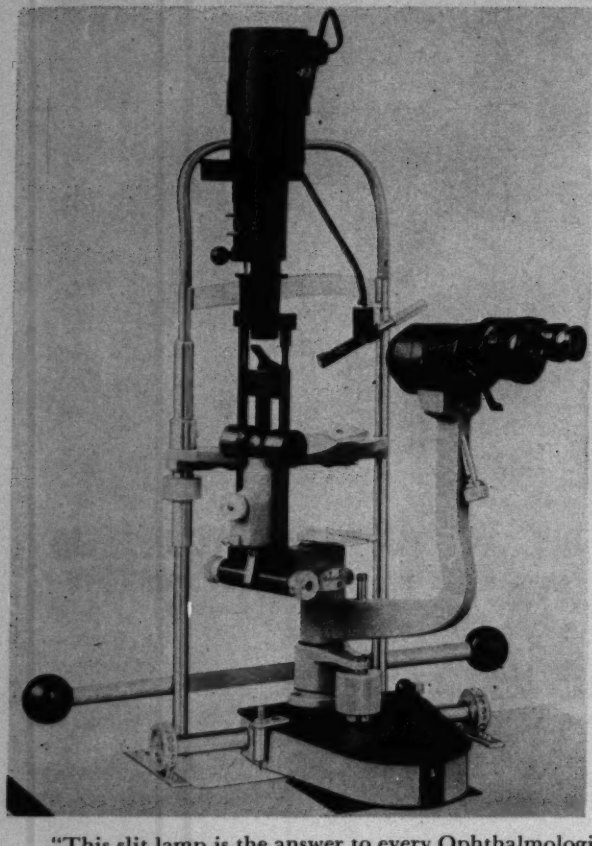

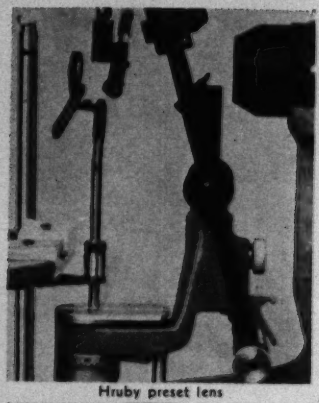

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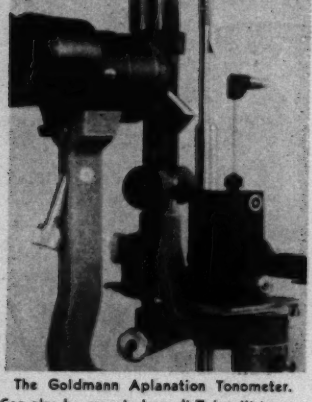

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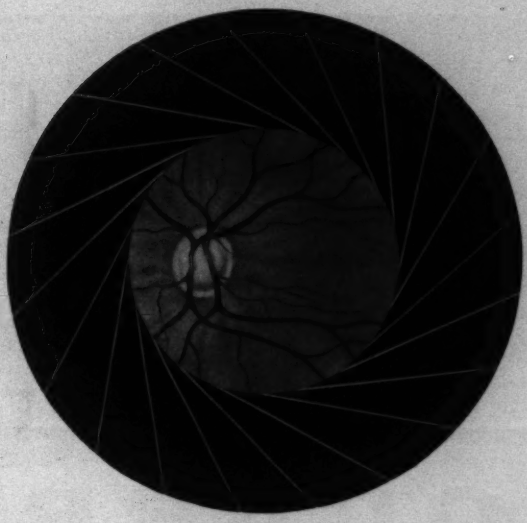

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1. Priestly, B. S.; Medine, M. M., and Phillips, C. C. To be published. 2. Abbquist, R. P. in Drill, V. A.: Pharmacology in Medicine, McGraw-Hill Book Company, Inc. New York, 1954, p. 18-26.

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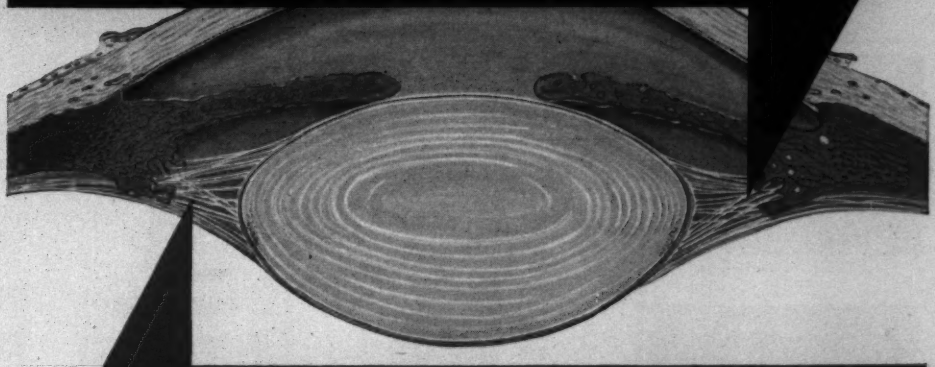

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1. Raiford, M. D.: J. M. A. Georgia 48:163, 1959. 2. Rizzuti, A. B.: A. M. A. Arch. Ophth. 61:135, 1959. 3. Cogan, J.E.H.: Proc. Roy. Soc. Med. 51:927, 1958.

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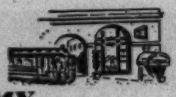

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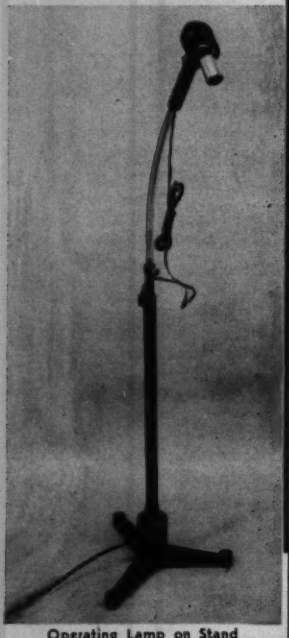

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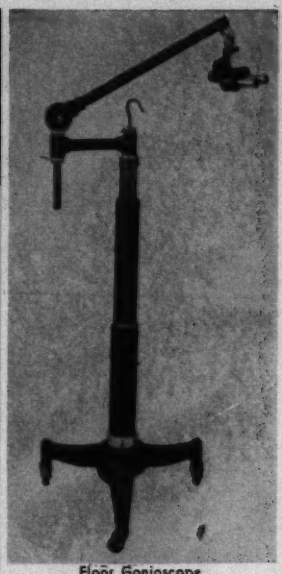
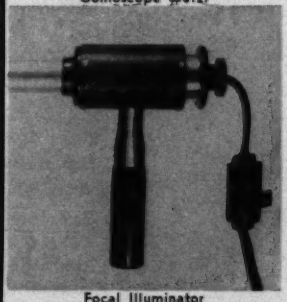
6110	Haag-Streit microscope, single power, 15×	195.00
6120	Haag-Streit microscope, two power, 10×-20×	250.00
	Charge for fitting your scope to 6101 stand	10.00
6127	Haag-Streit microscope with handle, 15×	195.00
6150	Otto Barkan Focal Illuminator with plug-in transformer*	47.50
6165	Otto Barkan Koeppe diagnostic lens, three sizes: 16-18-20 mm. lip diameters*	45.00
6175	Otto Barkan Goniotomy lens (surgical) Infant size*	45.00
6180	Otto Barkan Goniotomy lens (surgical) child-adult size*	45.00
6130	Otto Barkan operating lamp, hand model*	72.50
6140	Otto Barkan operating lamp, floor model*	97.50
6191	Otto Barkan Goniotomy knife (selected model)*	9.75

** Manufactured exclusively by Parsons Optical Laboratories.*



Floor Gonioscope #6100

Haag-Streit Hand Microscope for Gonioscope #6127



Focal Illuminator #6150

PARSONS OPTICAL LABORATORIES

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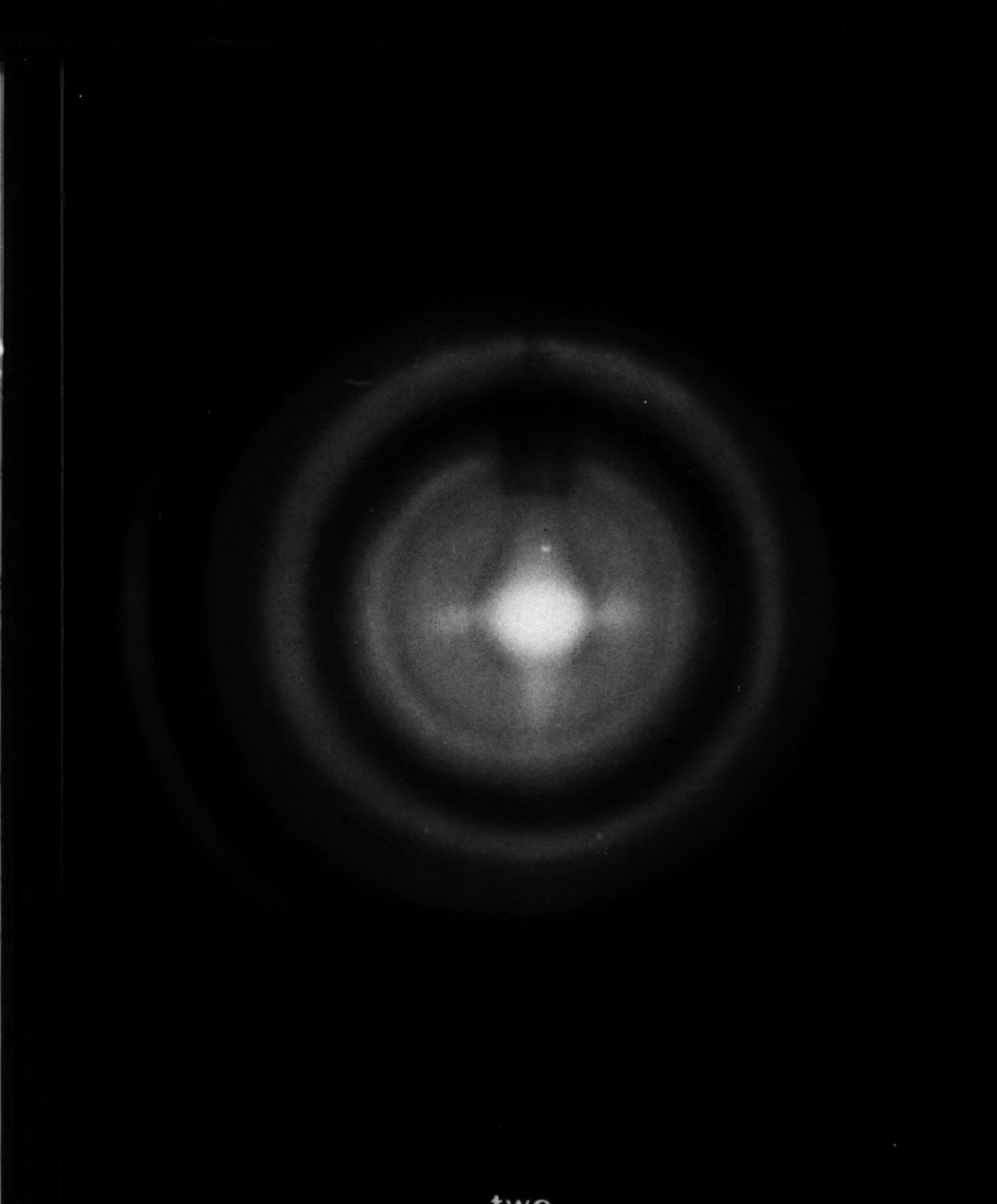

two

highly potent agents for improved therapy of glaucoma

oral control of intraocular pressure—even on long-term use

DARANIDE®

DICHLORPHENAMIDE

- inhibits aqueous humor formation
- continued effectiveness, even on long-term use
- reduces danger of metabolic acidosis inherent in other carbonic anhydrase inhibitors
- may be effective when other therapy, including miotics, has failed or has not been tolerated
- smooth control—few side effects
- low dose effectiveness—less dosage than with other carbonic anhydrase inhibitors
- fast acting
- 50 mg. tablets

topical control of intraocular pressure

NEW HUMORSOL*

DEMECARIUM BROMIDE

- more potent and longer acting than other miotics
- because it is unusually potent, it may be uniquely useful in breaking up peripheral synechiae
- aqueous—isotonic with conjunctival fluid
- stable
- can be used in combination with DARANIDE
- 0.25% solution, in 5 cc. vial with dropper

also available: **FLOROPRYL*** *for local treatment of glaucoma and strabismus*

ISOFLUROPHATE U. S. P.

0.1% solution, 0.025% ointment

Detailed information on 'Daranide', 'Humorsol', and 'Floropryl' available to physicians on request.

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*HUMORSOL, DARANIDE, AND FLOROPRYL ARE TRADEMARKS OF MERCK & CO., INC.

New

OPHTHOCORT® IN EYE INFECTIONS

WIDER ANTIBACTERIAL SPECTRUM

INCREASED THERAPEUTIC EFFICACY

CHLOROMYCETIN® (chloramphenicol, Parke-Davis): "...is effective against most gram-positive and gram-negative cocci and some gram-negative bacilli. It rarely produces dermatitis and resistant strains are uncommon."[1] "...penetrates the noninflamed eye better than any other antibiotic, regardless of route of administration."[2]

POLYMYXIN B SULFATE: "...gram-negative bacilli are being isolated with increasing frequency from the conjunctiva...."[3] Polymyxin B "...is bactericidal against most gram-negative microorganisms...."[4]

HYDROCORTISONE: "Cortisone, hydrocortisone and ACTH, by altering the inflammatory responses of the body, cause a decreased amount of scarring and vascularization."[5] "Hydrocortisone is about twice as potent gram for gram as cortisone, even when given locally."[5]

INDICATIONS: Provides wide-spectrum antibacterial, anti-inflammatory, and antiallergic action for topical treatment of patients with ocular inflammation complicated by infection.

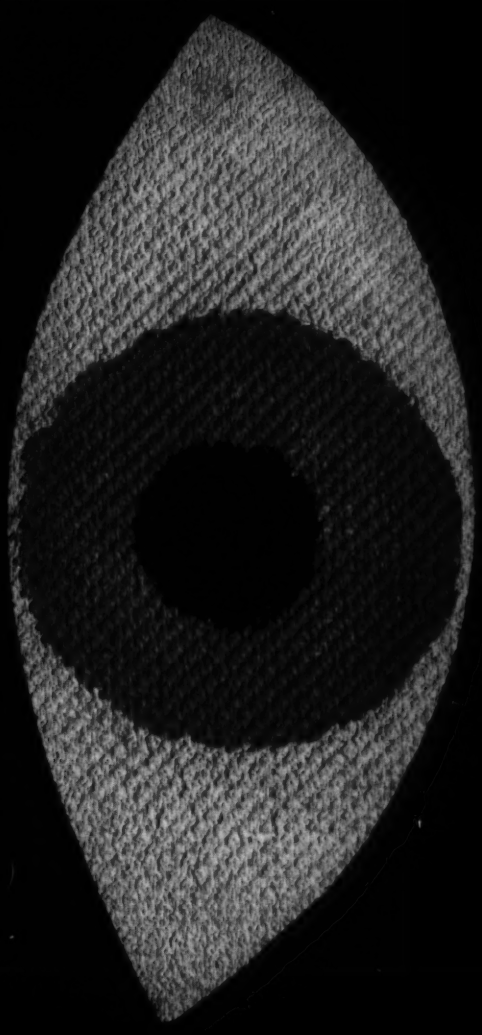
ADMINISTRATION: Local application two to four times daily as required.

SUPPLIED: OPHTHOCORT Ophthalmic Ointment contains 1% CHLOROMYCETIN® (chloramphenicol, Parke-Davis), 0.5% hydrocortisone acetate, and 5,000 units polymyxin B sulfate per Gm., supplied in ⅛-oz. tubes.

References: (1) Perkins, E. S.: **Practitioner 178**:575, 1957. (2) Queries and Minor Notes, **J.A.M.A. 161**:1032, 1956. (3) Smith, C. H.: **Eye, Ear, Nose & Throat Month. 34**:580, 1955. (4) Blakiston's New Gould Medical Dictionary, ed. 2, New York, McGraw-Hill Book Company, Inc., 1956, p. 945. (5) Ostler, H. B., & Braley, A. E.: **J. Iowa M. Soc. 44**:427, 1954.

PARKE, DAVIS & COMPANY

DETROIT 32, MICHIGAN



EFFECTIVE AIDS to successful contact lens FITTING to successful contact lens WEARING

BY BARNES-HIND OPHTHALMIC PRODUCTS, INC.

• Barnes-Hind Wetting Solution

for prolonged wetting-out action

Antiseptic; cleans and lubricates in one action. No ocular burning or stinging is possible with Barnes-Hind Wetting Solution Promotes desired floating action . . . makes long wearing possible . . . handy plastic 2 oz. bottle.

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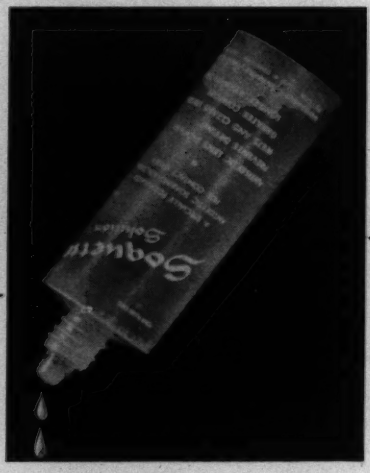
for germicidal lens storage

Eliminate drying out of contact lenses, causing blurring and irritation . . . increase wearing time . . . eliminate sensations of slide and pressure . . . with Soquette Solution, available in 4-oz. plastic single-drop delivery bottles.

Patients store lenses in Soquette Solution at all times when not wearing them. . . . Result, natural oils of the eye cannot cling to the surface of the lenses.



• Cotton-Tipped Minims

Sterile fluorescein in its safest, most convenient form....Be sure of 100% sterility...without wastage. Each Minims package is an individual sterile applicator for one patient, supplied in 20 individually over-wrapped Minims per package.

The cotton tip means that sterile fluorescein can be applied without the need for sterilized cutting instruments . . . just squeeze the unit and the fluorescein saturates the sterile cotton tip, which is then applied directly to the sclera. The Minims unit is then discarded.
The most modern method for fluorescein administration!

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Eyes Right!

the advantages of oil suspension
rapid even coverage on eye, lids, fornices . . . resists dilution by lacrimation . . . maintains effective antibiotic concentrations

the effectiveness of ACHROMYCIN
rapid suppression of common cocci and bacilli and of susceptible viruses—whether the primary infection or a complication of irritation, trauma, or inflammatory disease . . . fast resolution of swelling, erythema, and lesions . . . excellently tolerated

in the unique dropper-bottle
precise measurement of dose . . . clean . . . minimizes contamination . . . 4 cc. plastic squeeze dropper-bottle; 10 mg. (1%) ACHROMYCIN Tetracycline HCl per cc. sesame oil suspension

ACHROMYCIN®

Tetracycline Lederle

OPHTHALMIC OIL SUSPENSION 1%

Lederle LEDERLE LABORATORIES, A Division of AMERICAN CYANAMID COMPANY, Pearl River, N. Y.

PROFESSIONAL PHARMACAL CO., INC., PHARMACEUTICAL MFGS., SAN ANTONIO, TEXAS

GLAUCOMA THERAPY

REDUCE INTRAOCULAR TENSION

WITH BufOpto®

MIOCEL®

STERILE **BUFFERED** OPHTHALMIC SOLUTION

MIOCEL is a unique combination of Pilocarpine HCl and Eserine Salicylate. It is an excellent example of therapeutic synergism. Because the effects of Pilocarpine HCl and Eserine Salicylate on the pupil are additive, the administration of MIOCEL is generally more effective than the instillation of either drug alone. The direct stimulatory effect of Pilocarpine HCl in combination with the cholinesterase inactivating effect of Eserine Salicylate results in rapid, intense, and prolonged miosis. The special METHULOSE* base insures uniform and comfortable distribution throughout the conjunctival sac. MIOCEL is extremely useful in the control and treatment of glaucoma and other conditions where intensive miosis is desired.

PACKAGE SIZE
15 cc. Plastic Container
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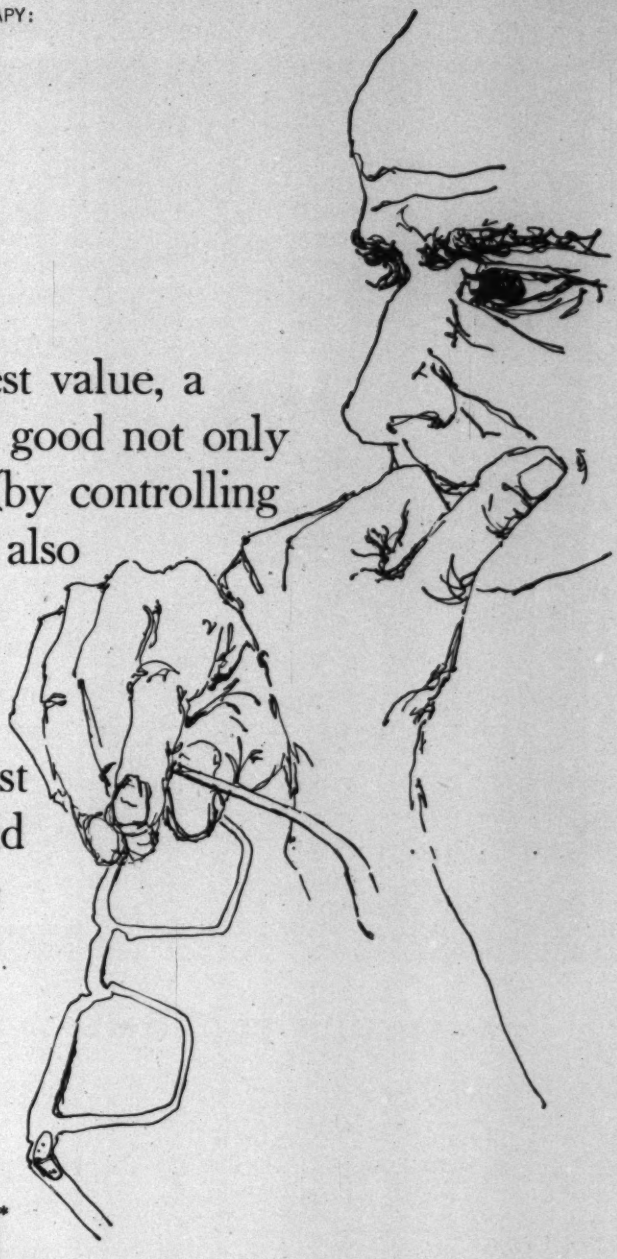
CONTAINS: ESERINE SALICYLATE ½ % AND PILOCARPINE HCl 2% IN A STERILE BUFFERED METHULOSE* BASE
Brand of Methylcellulose U.S.P. Reg. U.S. Pat Off.
Write for samples and literature.

PROFESSIONAL PHARMACAL CO., INC., Dept. J, 300 W. Josephine St., San Antonio, Texas

REFLECTION ON CORTICOTHERAPY:



To be of greatest value, a steroid must be good not only for the patient (by controlling symptoms), but also to the patient (by minimizing side effects). To be of greatest value, the steroid should have the best ratio of desired effects to undesired effects:

Medrol*

the corticosteroid that hits the disease, but spares the patient

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RECEIVED!
newest model
of well known
HEINE GONIOSCOPE
In our opinion this is the finest Gonioscope on the market. It's easier to handle, has better, more brilliant illumination.
• Prefocused, brilliant, air cooled light source.
• Precision German optics—6 times magnification.
• Rotating slit with easy fingertip control.
• Adjustable P. D.
• Modern design engineered for superb performance.

AVAILABLE FOR IMMEDIATE DELIVERY!

Heine Gonioscope (as illustrated) Catalog No. X25-P1 ..... **$334.50***

Heine Gonioscope complete with pulleys, counterweight and nylon cord, Catalog No. X25 ..... **$360.00***

Prices include 5 amp. 6 volt transformer.

The House of Vision Inc.

137 No. Wabash • Chicago 2, Illinois

IN GLAUCOMA

All Alcon Miotics have these product advantages: a Methylcellulose vehicle (which is chemically inert) to provide prolonged contact, give unexcelled absorption of drugs, lubricate and soothe the eye . . . strict quality control to assure sterility and uniform potency from bottle to bottle . . . tonicity and pH adjustments to give optimum patient comfort with maximum therapeutic effectiveness . . . sterile 15 cc. Drop-Tainer® packaging which reduces the likelihood of contamination during use . . . preservatives added.

each a product of choice

- **ISOPTO® CARBACHOL**—Carbachol U.S.P. in three concentrations (0.75%, 1.5% and 3%) in a 1% Methylcellulose vehicle.
- **ISOPTO® CARPINE**—Pilocarpine HCl U.S.P. in six concentrations (0.25%, 0.5%, 1%, 2%, 3% and 4%) with 0.5% Methylcellulose.
- **ISOPTO® P-ES**—Pilocarpine HCl U.S.P. (2%), Eserine Salicylate U.S.P. (0.25%) in a 0.5% Methylcellulose vehicle.
- **ISOPTO® ESERINE**—Eserine Salicylate U.S.P. in two concentrations (0.25% or 0.5%) in a 0.5% Methylcellulose vehicle.

Available at prescription pharmacies throughout the United States and Canada

Alcon Miotics have GREEN caps and dropper tips for easy identification.

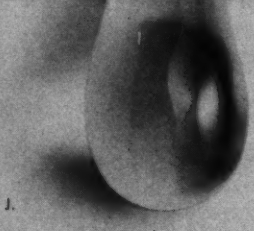
Alcon **ALCON LABORATORIES, INC., FORT WORTH, TEXAS**

at the pH of tears . . . No stinging or burning since Gantrisin Ophthalmic Solution is isotonic and is buffered at a physiological pH . . . stable and sterile. Antibacterially effective because Gantrisin Ophthalmic contains 4 per cent Gantrisin, the potent anti-infective . . . little likelihood of bacterial resistance. Multipurpose, because Gantrisin Ophthalmic is effective in common external ocular disorders, such as "pink eye" and nonspecific conjunctivitis, punctate and dendritic keratitis, superficial corneal ulcers, blepharitis . . . also consistently effective in many types of ocular trauma, for prophylaxis following surgery and after removal of foreign bodies.

GANTRISIN OPHTHALMIC SOLUTION

Available in 5-cc and ½-oz bottles with dropper.
Also available: Gantrisin Ophthalmic Ointment, in ⅛-oz tubes.

Gantrisin Diethanolamine Ophthalmic Solution and Ointment contain 4% Gantrisin® — brand of sulfisoxazole.
ROCHE®



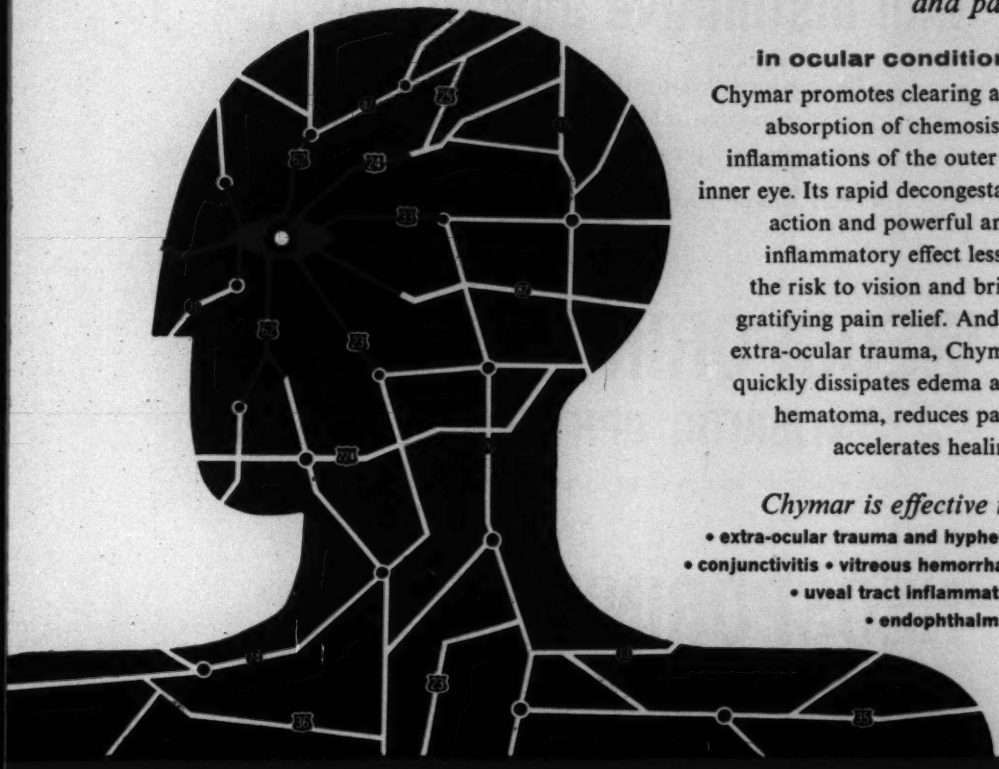
ROCHE LABORATORIES
Division of Hoffmann-La Roche Inc • Nutley 10 • N. J.

systemic route to faster healing

controls inflammation, swelling and pain

in ocular conditions

Chymar promotes clearing and absorption of chemosis in inflammations of the outer or inner eye. Its rapid decongestant action and powerful anti-inflammatory effect lessen the risk to vision and bring gratifying pain relief. And in extra-ocular trauma, Chymar quickly dissipates edema and hematoma, reduces pain, accelerates healing,



Chymar is effective in:

- **extra-ocular trauma and hyphema**
- **conjunctivitis**
- **vitreous hemorrhage**
- **uveal tract inflammation**
- **endophthalmitis**

superior anti-inflammatory enzyme

CHYMAR®

Buccal / Aqueous / Oil

CHYMAR *Buccal*
Crystallized chymotrypsin in a tablet formulated for buccal absorption. Bottles of 24 tablets. Enzymatic activity, 10,000 Armour Units per tablet.

CHYMAR *Aqueous*
Solution of crystallized chymotrypsin in sodium chloride injection for intramuscular use. Vials of 2 cc. Enzymatic activity, 5000 Armour Units per cc.

CHYMAR
Suspension of crystallized chymotrypsin in oil for intramuscular injection. Vials of 5 cc. Enzymatic activity, 5000 Armour Units per cc. and for enzymatic zonula lysis. Alpha CHYMAR.

ARMOUR PHARMACEUTICAL COMPANY
KANKAKEE, ILLINOIS • *Armour Means Protection*

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3 ophthalmic products with distinctive advantages...

- their wide-spectrum bactericidal activity includes *ALL clinically isolated strains of Pseudomonas aeruginosa*, a serious invader noted for the rapidity of its destructive powers.
- their component antibiotics rarely sensitize.

'NEOSPORIN'®
brand Polymyxin B-Gramicidin-Neomycin

ANTIBIOTIC OPHTHALMIC SOLUTION

Available in bottles of 10 cc. with sterile dropper.

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brand Polymyxin B-Bacitracin-Neomycin

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Available in ⅛ oz. ophthalmic tubes.

'CORTISPORIN'®
brand Polymyxin B-Bacitracin-Neomycin with 1% Hydrocortisone

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BURROUGHS WELLCOME & CO. (U.S.A.) INC., Tuckahoe, New York

IF INFECTION IS PRESENT OR PROBABLE

IN INFLAMMATORY AND ALLERGIC EYE AND EAR CONDITIONS

NEW

Neo-Aristocort®

Neomycin-Triamcinolone Acetonide 0.1%

EYE-EAR OINTMENT

Combining ARISTOCORT acetonide...described as the most effective topical corticosteroid yet introduced*...and the outstanding topical antibiotic, Neomycin.

NEO-ARISTOCORT provides excellent topical treatment of a wide variety of inflammatory and allergic eye and ear conditions where infection is either present or anticipated.

NEO-ARISTOCORT EYE-EAR OINTMENT contains: Triamcinolone Acetonide 0.1% and Neomycin Sulphate (0.35% base) 0.5% as the active ingredients; and light liquid petrolatum N.F. 15%, wool fat U.S.P. 10%, and white petrolatum U.S.P. q.s. w/v 100% as the inactive ingredients.

Tubes of ⅛ oz.

Also available:

Aristocort®

Triamcinolone Acetonide 0.1%

Tubes of 5 Gm. and 15 Gm.

CREAM AND OINTMENT

*Baer, R. L., and Witten, V. H.: Editorial Comment. /n The Year Book of Dermatology and Syphilology (1958-1959 Year Book Series), Edited by Rudolph L. Baer and Victor H. Witten, Chicago, The Year Book Publishers, 1959, p. 40.

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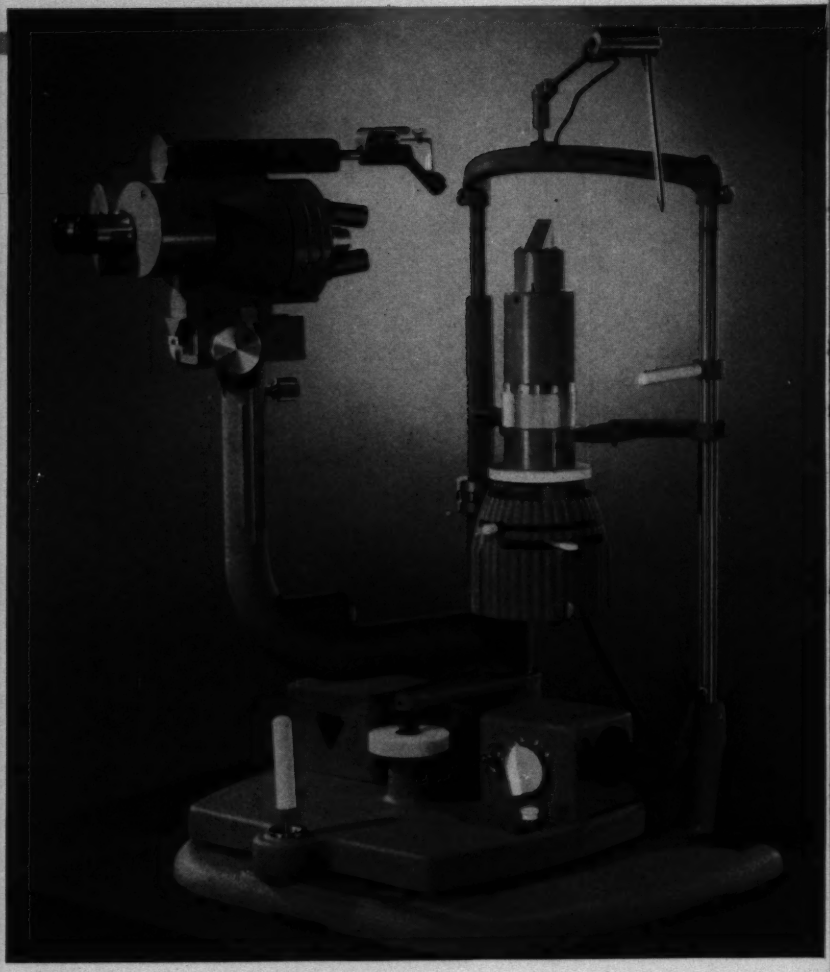
B&L

True complement



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All the features of the Bausch & Lomb Thorpe Slit Lamp serve to speed and clarify diagnosis. Sensitive controls and "click-set" adjustments are combined in such ways as to synchronize focus of microscope and slit for precise advantage.

It is an instrument second to none in optical quality, in illumination, in smooth-as-silk mechanical operation.

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Thorpe Slit Lamp

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This is the one you've asked for—Rondon Browline® Frame in anodized aluminum! The same younglike styling . . . same "cornering" of bolder, contemporary front into new wide, chevron-embossed Regis temple . . . same time- and temper-saving latch-lock interchangeability of toprims.

You'll like the way Rondon looks in aluminum . . . and your younger patients (and those who would like to look younger) will look the way they like.

In Gunmetal, Ebony, Bronze and Brown—44, 46 and 48mm (18 to 24 bridge) ; 50mm (20 to 24). Shuron Optical Company, Geneva, N. Y., Rochester, N. Y.

FOR THE LOOK THEY'LL LIKE

dynamic control of GLAUCOMA

IN DIAGNOSIS – By reducing corneal edema, DIAMOX facilitates examination and diagnosis in ophthalmologic disorders.

AS THERAPY – By lowering intraocular pressure, conservative therapy with DIAMOX can often reduce the need of surgical intervention in various glaucomatous conditions. Traumatic hyphemas, for example, can be resolved without cyclodiathermy puncture.[1]

PRE- AND POSTOPERATIVE CARE – Where surgery is required, tension is first reduced by DIAMOX and maintained after surgery to speed healing. Used with miotics, the synergistic action improves efficacy.[1]

Suggested DIAMOX dosage for glaucoma: 250 mg. every four hours. In severe glaucomatous crises, the intravenous form may provide quicker reduction of global pressure.

Supplied: Scored tablets of 250 mg., and Vials of 500 mg. for parenteral use.

1. Venable, H. P.: J. Nat. M. A., 50:79, 1958.

DIAMOX®

HCO_3 regulating diuretic

Acetazolamide Lederle

LEDERLE LABORATORIES, a Division of AMERICAN CYANAMID COMPANY, Pearl River, New York

As you examine your patients . . . they're examining you!

American Optical's modern instruments and office equipment combine high fashion beauty with planned efficiency to make your work easier and create the "right" impression on your patients. Your own high professional standards are reflected in crisp, clean "American Beauty" styling and soft, rich colors . . . Ivory Tan, Jade Green and sparkling Coral. This is an office you can be proud of . . . an office that says, "welcome", in warm, subtle tones . . . inspires patient confidence . . . reduces patient tension.

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the *NEW* AO HI-LIFT Motorized Chair

The New AO Hi-Lift Chair elevates twice as high as ever before. A touch of the foot pedal...and the patient moves up or down to your preferred working level. Height of instruments need not be readjusted to each patient.

This efficiency will last too: Exclusive handsome design of the fully enclosed motorized base incorporates a completely sealed-in pumping mechanism. It is ready to operate upon installation...oil need never be added or changed. Long-term warranty completely protects this exceptional system.

New foot rest for adults folds up to facilitate easy seating of aged or physically handicapped patients...children's foot rest folds down, out of the way, when not in use.

Arms, back rest and head rest quickly adjust to securely position *any* patient. Even the thick foam-rubber cushioning is shaped to fit body contours. Your patient is virtually surrounded with comfort to reduce tension...make refractions easy, pleasant.

Easy-to-use, handsome-to-see, these chairs with exclusive American Beauty styling have an up-to-the-minute look... bright modern colors; ivory tan, jade green and sparkling coral. Color co-ordinated Bark Weave Naugahyde upholstery looks bright and fresh for years.

See your AO Sales Representative for a demonstration or send coupon for fully illustrated brochure.

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Please send complete information and illustrated brochure on AO's New Hi-Lift Chair Units.

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Yes, he's the type for **INVADER**

if it's out-front, it's UNIVIS

The type for INVADER? Yes, the leader . . . or the man with qualities of leadership. Ambitious, bold . . . exactly the qualities of this new Univis INVADER zyl frame! Notice the rugged masculine eyeshape, the polished contoured edges, the rounded end pieces, the distinctive shield. Look at the comfortable keyhole bridge. Lightweight, too! In Brown Smoke, Gray Smoke, Brownwood, Blackwood.

Send for complete descriptive booklet.

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PROFESSIONAL SERVICES DIVISION
The Univis Lens Company, Dept. H
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Please send information on the new INVADER frame.

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At Last... a new cataract lens that lets aphakic patients SEE the difference!

FIRST ASPHERIC GLASS CATARACT LENSES

VOLK Catra Conoid BIFOCALS

AMERICAN BIFOCAL CO., INC.

Now Patients Can Have Clear Vision from Edge to Edge.... Check These Advantages

√ Crown glass enables precision grinding and permanent surface curvatures required for ideal correction of lens aberration.

√ Abrasion-resistance of crown glass insures long, useful life.

√ Crown glass and aspheric curves reduce chromatic aberration.

√ Elimination of distortion of both stationary and moving objects.

√ Uniform magnification increases peripheral vision.

√ All aberrations optimally corrected for every lens power.

√ Aspheric curves permit lens to be thinner and lighter.

√ Patient's eye appears normal and undistorted to others.

√ Elimination of marginal astigmatism gives clear, wide-field reading vision.

√ A large 22mm straight-top, color-free reading segment is incorporated.

√ Lenses are available in semi-finished form for completion by local Rx lab.

√ Local laboratory may resurface inner spherical side of lens when necessary.

√ Patient's post-operative adaptation to cataract lenses is easier.

VOLK CATRACONOID LENSES ARE AVAILABLE IN 50mm DIAMETER

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AMERICAN BIFOCAL CO., INC.

FOREMOST PRODUCERS OF MULTI-FOCAL LENSES

Exclusive Manufacturers of: VOLK CONOID LENSES FOR SUBNORMAL VISION
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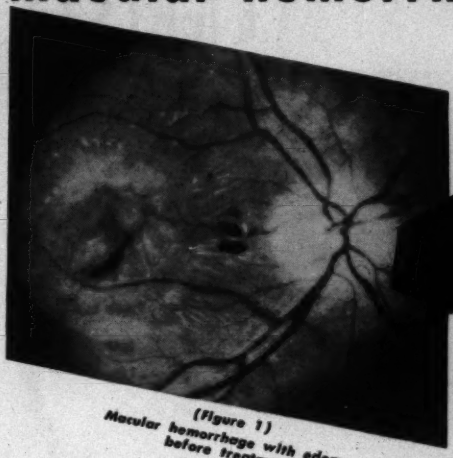
1440 ST. CLAIR AVENUE, CLEVELAND 14, OHIO

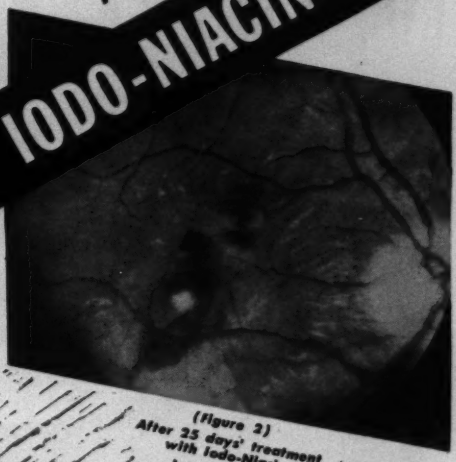
macular hemorrhages

respond to

IODO-NIACIN*



(Figure 1)
Macular hemorrhage with edema, before treatment



(Figure 2)
After 25 days' treatment with Iodo-Niacin

NO IODISM

Macular and retinal hemorrhages are satisfactorily absorbed after use of IODO-NIACIN[1]. The dosage used in this study was 1 tablet three times daily.

In cases of cerebral and generalized arteriosclerosis, IODO-NIACIN has been used with great benefit[2]. Full doses were given for a year or longer without any iodism or ill effects.

The formula of IODO-NIACIN Tablets contains potassium iodide 135 mg. (2¼ gr.) combined with niacinamide hydroiodide 25 mg. (⅜ gr.). IODO-NIACIN Ampuls 5 cc. are highly satisfactory for intramuscular or intravenous use[3].

Since the retina is intrinsically a part of the brain[4], hemorrhages in this region are indicative of a similar cerebral condition for which IODO-NIACIN is directly indicated.

IODO-NIACIN Tablets, slosol coated pink, are supplied in bottles of 100. Ampuls 5 cc. in boxes of 10.

1. *Am. J. Ophth.* 42:771, 1956.
2. *Am. J. Digest Dis.* 22:5, 1955.
3. *Med. Times* 84:741, 1956.
4. *Cecil's Textbook of Medicine*, 7th ed., 1947, p. 1598.

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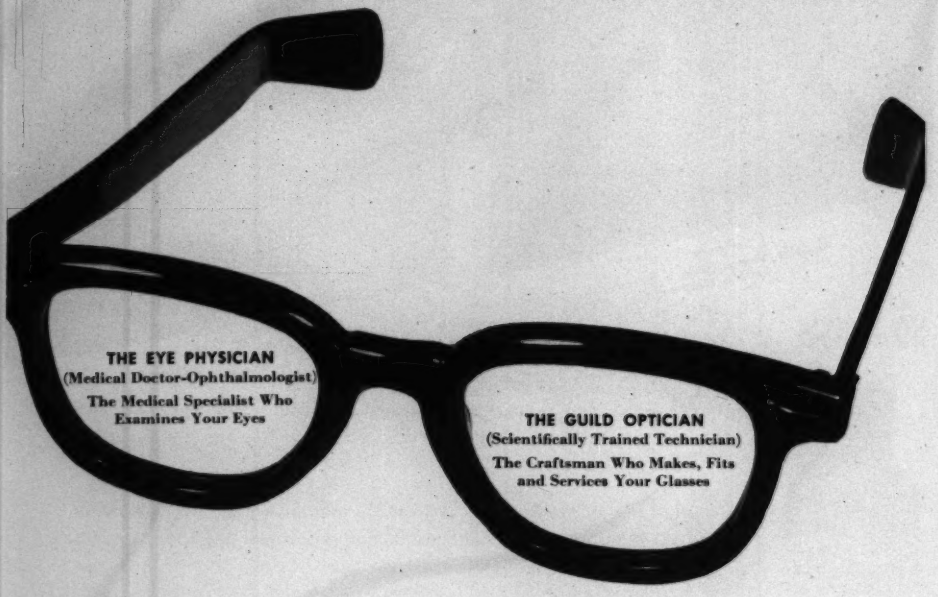
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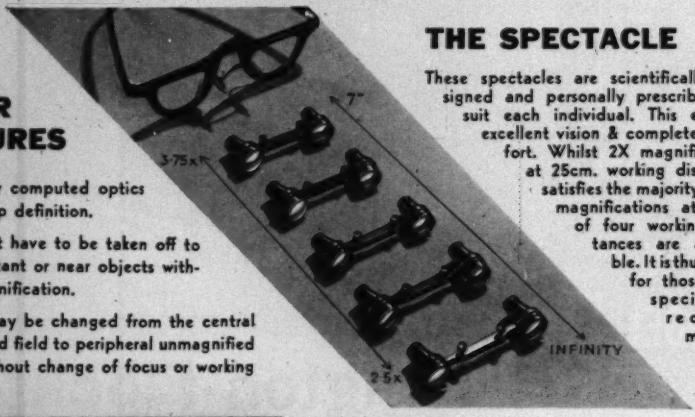

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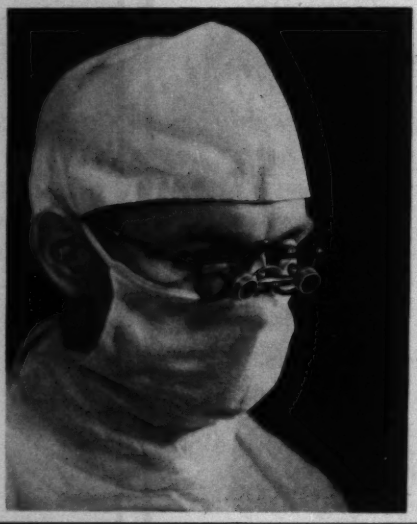

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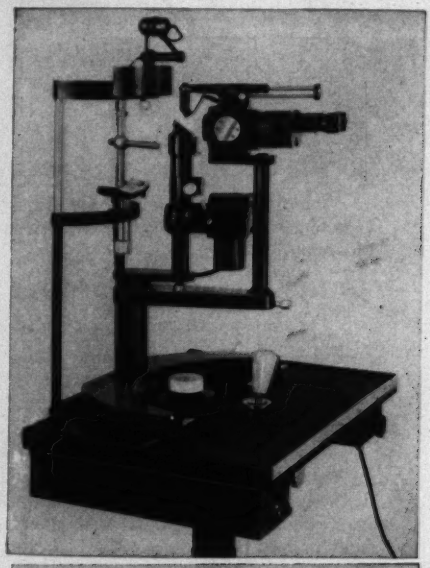

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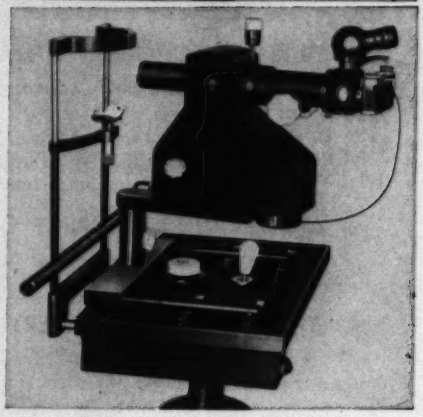

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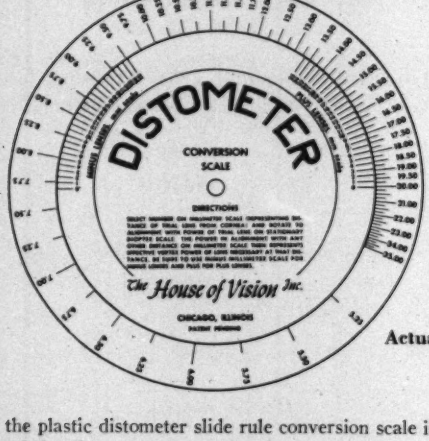

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ABSTRACTS

Diagnosis and therapy; Ocular motility; Conjunctiva, cornea, sclera; Uvea, sympathetic disease, aqueous; Glaucoma and ocular tension; Crystalline lens; Retina and vitreous; Optic nerve and chiasm; Neuro-ophthalmology; Eyeball, orbit, sinuses; Eyelids, lacrimal apparatus; Tumors; Injuries; Systemic disease and parasites; Congenital deformities, heredity; Hygiene, sociology, education, and history 692

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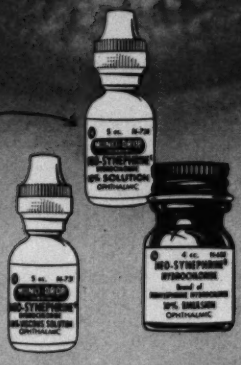

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VOLUME 48 NOVEMBER, 1959 NUMBER 5, PART I

THE OCULAR FINDINGS IN CAROTID-CAVERNOUS FISTULA IN A SERIES OF 17 CASES*

JOHN WOODWORTH HENDERSON, M.D., AND RICHARD C. SCHNEIDER, M.D.
Ann Arbor, Michigan

The occurrence of a vascular shunt between the intracranial internal carotid artery and the cavernous sinus may produce serious ocular symptoms and signs. Because of its extradural location, such an arteriovenous fistula does not result in fatal intracranial bleeding, but is compensated for by the drainage of the arterial blood along channels emerging from the cavernous sinus, reversing the usual venous flow. The occurrence of ocular symptoms depends upon the course taken by the mixture of arterial and venous blood in reaching the jugular vein. Six possible emergent venous pathways have been documented.[1] Two of these may affect the orbit and its contents. The first leads from the cavernous sinus by way of the superior ophthalmic vein to the facial veins and finally to the internal jugular. The second, by way of the inferior ophthalmic vein, reaches both the pterygoid plexus and the facial veins to enter the internal jugular vein. List and Hodges[2] felt that usually the superior ophthalmic vein is the most important venous outlet, and arteriographic examination confirms this view in most instances (fig. 1).

The space occupied by the greatly distended ophthalmic veins, together with the heightened venous back pressure involving the orbit and its contents, results in the characteristic symptoms of visual impairment, diplopia, headache, and retro-ocular or ocular pain. The patient may complain bitterly of a swishing noise in his head, and the finding of a bruit together with the objective signs of proptosis, injection of conjunctival and retinal veins, pulsation of the globe, conjunctival chemosis, and periorbital flush or venous dilation, confirms the diagnosis. In addition, involvement of cranial nerves vulnerable in the cavernous sinus and of other nerves damaged by the trauma precipitating the fistula adds to the problems of management.

The first report of treatment of this condition was that of Travers,[3] published in 1811, which presented the results of ligating the common carotid artery for pulsating exophthalmos. Many excellent summaries of the literature including collected cases have appeared since that time. Among these are the contributions of deSchweinitz and Holloway in 1908,[4] Bedell in 1915,[5] and more recently Sattler,[6] Locke,[7] Birch-Hirschfeld,[8] Dandy,[9] Sugar and Meyer,[10] and Martin and Mabon.[11] These authors added progressively to the collected cases in the literature until Martin and Mabon were able to review the findings in a total of 817 patients. Among more recent reports the excellent monograph of Hamby[12] and the short series of patients reported by Holman et al.,[13] by Elliot,[14] and by Walker and Allègre[15] have elucidated newer problems in management.

The pathology of carotid-cavernous fistula was thoroughly documented by Dandy and Follis[16] who found reports of 29 previously studied pathologic specimens in the literature and added two of their own. They believed

* From the Department of Ophthalmology and Department of Surgery, Section of Neurosurgery, The University of Michigan. Presented at the 93rd annual meeting of the American Ophthalmological Society, White Sulphur Springs, West Virginia, May, 1958.

Fig. 1 (Henderson and Schneider). Arteriograms, showing marked engorgement of the superior ophthalmic vein in an early patient of the series.

that carotid-cavernous fistulas may arise as a result of trauma to a normal internal carotid artery or from injury to a previous arteriosclerotic or aneurysmal carotid within the cavernous sinus. They stated that the occurrence of bilateral proptosis is due to larger intercavernous venous connections, and demonstrated that the degree of exophthalmos present is not due to the size of the fistula alone, but is more directly related to the available venous collateral channels which can take the burden off the ophthalmic veins.

It is with considerable relief that we were able to find, prior to this meeting, one of the earlier reports on pathology given by Dr. Verhoeff in a paper presented by Dr. Jack of Boston at the 1907 meeting of the American Ophthalmological Society.[17] The patient described had sustained a rupture of a previous internal carotid aneurysm into the cavernous sinus and died following common carotid ligation. In addition, compression atrophy of the homolateral optic nerve, presumably due to the previously existing aneurysm, was demonstrated.

Acknowledging that many excellent summaries have already appeared, we hope that a review of the present series may add to the proper management of these difficult patients. Further it is hoped that a discussion of certain of the problems which arose in this group of patients may kindle renewed interest in co-operative treatment by ophthalmologists and neurosurgeons.

Present study

Having encountered a number of patients with carotid-cavernous fistula as problems in common, we initiated a review of patients treated at the University Hospital in the years 1941 through 1957. Several had died, but those who could be traced were brought back for further examination and the remainder were studied from the hospital records. Seventeen patients with a diagnosis of carotid-cavernous fistula are included in the present series. The ocular symptoms and signs will be dealt with specifically, and results of treatment by various methods will be discussed.

Sex and age

The incidence by sex and age of the patients is:

Sex	*No.*
Male	10
Female	7

Age (yr.)	
Under 20	3
20 to 30	3
30 to 40	3
40 to 50	4
50 to 60	4
Total	17

In contrast to the reports of the greater incidence of traumatic cases in men in the third decade,[18] the present series has a distribution nearly equal in the various age groups. This perhaps is a reflection of the fact that trauma resulting from automobile accidents is now more common.

Etiology

Accumulated figures from the literature[6,7] show that approximately 25 percent of carotid-cavernous fistulas are spontaneous and 75 percent are traumatic, with spontaneous ones more frequent in women. The etiology of the present series is noted below:

Spontaneous onset	3
Traumatic onset	14
Types of trauma	
Automobile accident	8
Assault	
Blunt instrument	3
Gunshot wound	1
Stab wound	1
Trench cave-in	1

A spontaneous onset was postulated for the condition in two women and one man. In one of the women there was no history of injury, and in the other two patients the trauma was not recent (two and one-half years and seven years). In the patients with a traumatic onset auto accidents were the most common cause, with assault a somewhat less frequent factor. Six of the 14 patients with antecedent trauma were shown to have basilar-temporal skull fractures by X-ray examination. Walsh[18] notes that in basilar fractures a high incidence of injury of the sphenoid bone occurs, and since this bone lies beneath the relatively fixed internal carotid artery and cavernous sinus, tears in the artery and sinus are likely to follow.

The time of onset after injury varies:

Within 24 hours	6
2 days to 1 week	4
2 to 3 weeks	3
3½ months	1

In six patients signs of carotid-cavernous fistula appeared within 24 hours, and in three of these skull fractures had been sustained. In four more they had appeared by the end of a week after injury, and in none of these was a fracture demonstrated. Of the three patients with an onset occurring from two to three weeks after injury, two had fractured skulls, and in one patient with a fracture the onset was delayed for three and one-half months.

Symptoms

The symptoms complained of by the patients at the onset and prior to treatment are listed below:

Visual impairment or blur	10 (59%)
Diplopia	9 (53%)
Headache	9 (53%)
Ocular or retro-ocular pain	6 (35%)
Swishing noise in head	8 (47%)

Impairment of vision or blurred vision was the most frequent complaint, always on the side of the fistula. This was not always confirmed by tests of visual acuity, since several patients confused minimal diplopia with visual blurring. A definite complaint of double vision was given by nine patients. Headache, usually on the side of the fistula, was noted by nine patients during the onset of the condition, and six individuals complained of ocular or retro-ocular pain homolateral to the lesion. A direct complaint of a swishing noise in the head was mentioned in the histories in only eight of the patients. This is in sharp contrast to the finding of an audible bruit with the stethoscope in 15 of the 17 patients. The low incidence of subjective bruit as an entering complaint is at variance with other writers who emphasize that the murmur in the patient's head is often what leads him to seek treatment. However, in several of the series the bruit

appeared only during the hospital course after the patient had originally been admitted for the management of head trauma.

The orbital signs found in the examination of the 17 patients are given below:

Protosis	17 (100%)
Dilated retinal veins	13 (76.5%)
Conjunctival injection	15 (88%)
Audible bruit	15 (88%)
Objective visual loss	
Before treatment	9 (53%)
After treatment	5 (29%)
Chemosis	6 (35%)
Pulsation of globe	5 (29%)
Periorbital flush, edema, or venous dilatation	8 (47%)

Proptosis of the involved eye was present in all cases. In none was the ocular protrusion opposite to the side of the vascular communication. No impression was gained by any of the examiners that proptosis was also present in the second eye, and a review of the serial exophthalmometer readings gives no evidence that this was missed. Cases have been reported where the exophthalmos was contralateral to the side of the fistula,[16] and bilateral protusion of the globes has been ascribed to large intercavernous venous communications. Hamby[12] stated that in bilateral exophthalmos the second eye usually protrudes later, but that the degree of exophthalmos may become almost equal between the two sides.

Original exophthalmometer readings were available for 12 patients. The greatest relative protrusion was 11 mm., the least was 3.0 mm., and the average for the group was 7.5 mm. The average reported by Dandy was about 8.0 to 10 mm.[9] It might be assumed that the duration of the fistula would have a direct bearing upon the degree of proptosis. One patient with a protrusion of 11 mm. had had the disease for six months, another with one of 9.5 mm. for five months, and one with one of 9.0 mm. for three years. However, one patient with 10.5 mm. of proptosis had had it for only one week, and another with 8.5 mm. for only one month. It is likely that the size of the arteriovenous communication, the other venous collateral, and the relative dilatation of the orbital veins is a more important factor in the degree of proptosis than is the duration of the disease.

The direction of displacement of the globe is related to the location of the major mass of orbital veins,[12] and in the present series was usually down and out because of engorgement of the superior ophthalmic vein and its branches. Sattler[6] found displacement down and out in 55 percent of his cases, down and inward in 26 percent, and downward in 15 percent.

Dilated retinal veins were noted in the original examination in 13 of the 17 patients (76.5 percent). This is a lesser incidence than that of Sattler[6] who found dilated veins in over 90 percent of his 157 cases. Retinal hemorrhages were seen in only one case before treatment. No definite evidence of papilledema was recorded in any patient. Conjunctival injection, often with tortuous perilimbal vessels, is one of the most prominent external signs of this disease, and was found in 15 of the 17 patients. Associated with this is the finding of chemosis of the conjunctiva (fig. 2), especially when the venous back pressure is acute. However, chemosis was noted in only six patients. This is at variance with reported figures in the literature, such as those of Martin and Mabon[11] who reported chemosis in 71 percent of their patients. However, it is likely that nonophthalmologic observers are less apt to differentiate between chemosis and conjunctival vascular injection.

Pulsation of the globe has been described as one of the cardinal signs of carotid-cavernous fistula. In fact, the disease is often categorized erroneously under the heading of pulsating exophthalmos. Actual pulsation was reported for only five patients, or 29 percent. In three of these the pulsation was grossly visible, and in two it was discovered by noting a greater swing of the tonometer needle on the eye involved. This "tonometer sign" was described by Boyes and Ralph[19] and is a valuable aid in the diagnosis of pulsation. There was no mention in

Fig. 2 (Henderson and Schneider). Marked chemosis and proptosis which failed to resolve following surgery.

the examinations of pulsating forward movement of the globe seen with the Hertel exophthalmometer as noted by Swan and Raaf,[20] but this sign has been noted by us in a case currently under treatment. Palpable pulsation was not recorded in the majority of the cases, but in several the sensation of a "thrill" over the globe or the angular vein was mentioned. Hamby[12] stated that the pulsation may not be visible at all but is usually palpable. It is likely that pulsation may have been overlooked in certain of the present cases, since Birch-Hirschfeld[8] stated that pulsation is missing in only five percent of patients.

There was evident periorbital flush, edema of the lids, or visible venous dilation in the skin over the orbital region in eight patients of the series. None showed the pulsating visible mass in the upper inner angle of the orbit which Birch-Hirschfeld noted in one third of cases of long duration.[8]

Visual loss

Objective evidence of visual loss was present during the onset of the disease in nine patients, or 53 percent. In several who were critically ill from trauma, visual acuities were not recorded prior to treatment. In five patients, or 29 percent, late visual loss was recorded. In one, after permanent bilateral abducens palsy related to the original trauma of skull fracture, moderate visual reduction to 6/12 together with minimal contraction of the visual field was noted on the side of the fistula. However, this was apparently also the suppressed eye in avoidance of diplopia. In a second patient with a reduction of only one line on the chart at the onset, the field became contracted on the same side after cervical ligation of the internal carotid, and a late visual acuity of 5/60 was recorded, along with a total failure to reduce the proptosis. In three patients complete loss of vision in the eye on the affected side followed treatment. In one of these a

severe skull facture with multiple cranial nerve palsies was present at the onset along with marked visual reduction, and vision continued to fail despite serial surgery which finally included clipping of the ophthalmic artery. In a second patient early moderate visual reduction was followed by a sudden drop to light perception following simultaneous cervical and intracranial internal carotid ligation which included direct closure of the ophthalmic artery. Light perception decreased to blindness, and nearly a year later visual failure ensued in the remaining eye. It should be mentioned that this was one of the older patients in the series. In the third case severe skull fracture preceded the onset of the fistula and preoperative vision was not obtained. Following combined cervical and intracranial internal carotid ligation with direct clipping of the ophthalmic artery, vision was moderately blurred in the eye on the same side. The marked chemosis in this patient failed to resolve (fig. 2), and multiple Frost sutures were placed to avoid exposure of the globe. Six days later the sutures were removed, and the eye was found to be blind with evidence of closure of both the central retinal artery and vein. Whether the pressure of the closed lids contributed to the visual loss, or whether the surgery itself led to vascular closure, remains unanswered. The three patients with blindness in the involved eye after treatment later developed secondary glaucoma and cataract formation in the affected eye, and enucleation was necessary for cosmetic reasons in one.

Visual failure in the eye on the side of the fistula has been reported as a frequent finding in carotid-cavernous fistula patients. Dandy[9] discussed the expectancy of vision in untreated cases and stated that loss of vision is to be expected. In Sattler's series,[6] total blindness was present in the involved eye in 26 percent of the patients, near blindness in 20 percent, and over 50 percent loss of vision was noted in an additional 27 percent. DeSchweinitz and Holloway[4] found that not more than 11.1 percent of patients retained normal vision. Dandy's percentage of patients with little or no impairment of vision was considerably higher than previous series, but operative treatment had been instituted early. He concluded that the sooner adequate means of relief are begun, the better the patient's chances are of retaining vision, and stated that the hope of spontaneous cure was too small to risk leaving the patient untreated.

Blindness or severe visual loss resulted in only four patients of the present series (24 percent). In five cases where objective visual reduction was present before treatment, later examinations gave evidence of visual improvement to normal or near-normal (29 percent). In seven of the patients the ophthalmic artery, as well as the internal carotid artery, was deliberately occluded intracranially. In one patient there was marked impairment of vision immediately following the operation. In two other patients vision continued to fail following this procedure, but not immediately. However, five patients who had direct clipping of the ophthalmic artery had no visual difficulty as a result of surgery.

Clipping of the ophthalmic artery as a part of intracranial ligation was first suggested by Hamby and Gardner,[21] discussed by Dandy,[22] and accomplished first by Adson.[23] This is a relatively safe procedure because of the rich collateral arterial supply from the external carotid to the ophthalmic as proved by Walsh and King[24] who repeated and confirmed earlier experimental work.

The genesis of visual failure in the vascular embarrassment of carotid-cavernous fistula is due to both arterial and venous impairment of retinal circulation.[14] Because of the internal carotid arterial shunt into the cavernous sinus, the effective pressure in the ophthalmic artery is reduced. At the same time the dumping of arterial blood into the ophthalmic veins causes venous stasis. Hence both the central retinal artery and

the central retinal vein are embarrassed, and local anoxia results. If, as is often the case, ample collateral occurs between the external carotid and ophthalmic arteries, reverse flow through the ophthalmic enters the internal carotid to feed the fistula. Adson[23] saw an actual pumping of bright red arterial blood through the ophthalmic artery into the trapped segment of the internal carotid after ligating both in the neck and above the fistula and saw the need for direct clipping of the ophthalmic artery. It therefore appears that such direct clipping of the ophthalmic artery should divert the external carotid collateral into a more adequate supply for the central retinal artery and result in preservation of vision. It is likely that in the cases of the present series in which visual failure followed this procedure the available collateral by way of the external carotid branches was not adequate.

Involvement of cranial nerves

Involvement of the cranial nerves other than the optic nerve is listed below:

Oculomotor	7 (41%)
Trochlear	6 (35%)
Abducens	10 (59%)
Bilateral ocular palsies	3 (18%)
Trigeminal	5 (29%)
Facial	6 (35%)
Acoustic	3 (18%)
Glossopharyngeal	1 (6%)
Hypoglossal	1 (6%)

Accessibility of the motor nerves for ocular rotations within the cavernous sinus makes them prone to involvement. The abducens was most frequently affected (59 percent), the oculomotor was implicated in varying degree in 41 percent of the patients, and the trochlear in 35 percent. Bilateral ocular palsies were noted in three patients, all of whom had suffered skull fractures. In all three permanent paralyses resulted, indicating original direct trauma to the nerves. For comparison, Sattler[6] found an incidence of 62 percent abducens palsy, 28 percent oculomotor involvement, and 10 percent trochlear paralysis.

The trigeminal is the only other cranial nerve involved directly either by the fistula, or by pressure on the first division by the dilated ophthalmic vein as the structures cross in the superior sphenoidal fissure.[12] Involvement of other cranial nerves is listed above, and these involvements are presumably due to the original trauma which precipitated the fistula. Damage to the trigeminal and facial nerves, as evidenced by decreased sensation or by lagophthalmos, presents a constant threat to the globe where proptosis is already a serious problem. Tarsorrhaphy was found necessary for this reason in three patients of the series in order to protect the eyeball.

The results of X-ray examination, shown below, are of interest if only to point out the importance of arteriography in substantiating the diagnosis:

Negative skull films	6
Fracture basilar-temporal	6
Facial bones	1
Parasellar erosion	1
Retained foreign body	1
Arteriography performed	16
Positive diagnosis	16

Negative skull films were reported for six patients. Skull fracture was present in seven. One instance of parasellar erosion was found. Retained foreign bodies from a previous gunshot injury through the roof of the mouth were noted in one patient. Sixteen of the 17 patients were examined angiographically, and the diagnosis was substantiated in every instance. A positive result is indicated by a signet ring appearance of the contrast medium flowing from the internal carotid into the cavernous sinus, together with filling of the emergent venous channels, most often the ophthalmic veins (fig. 3).

Secondary glaucoma

The occurrence of secondary glaucoma as a part of this clinical entity has been reported by many writers and brought principally to attention by Sugar and Meyer.[10] These authors noted an incidence of 11

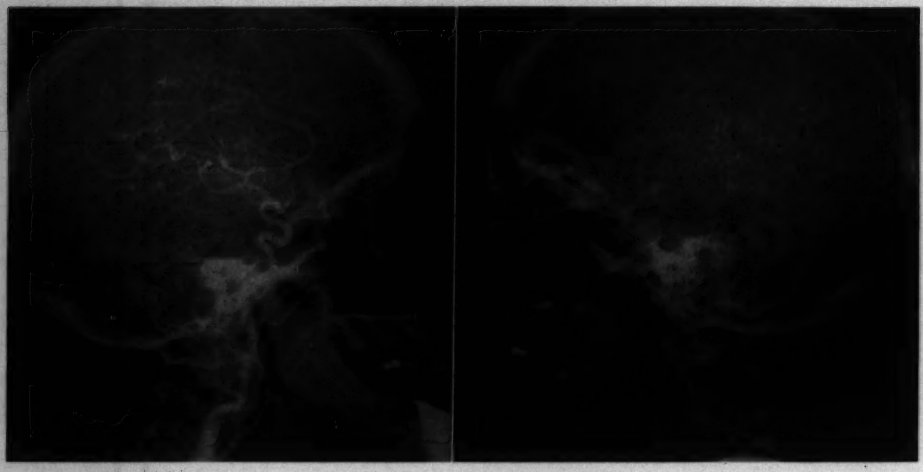

Fig. 3 (Henderson and Schneider). Arteriogram, showing the characteristic signet-ring appearance of the cavernous sinus in carotid-cavernous fistula.

cases in a collected series of 165 (6.7 percent). However, in reviewing the literature they found the greatest previously reported frequency to be approximately 25 percent. They mentioned further that it was likely that glaucoma had been missed in many series which had been studied and reported principally by surgeons and neurosurgeons. This view appears substantiated by the present series since seven of the 17 patients (41 percent) had definite secondary glaucoma either by tonometer measurement or by final pathologic examination of the globe:

INCIDENCE OF SECONDARY GLAUCOMA

Secondary glaucoma	7 (41%)
Normalized by pilocarpine	1
Normalized by surgical treatment of fistula	3
Postoperative with blindness and cataract	3
Significant fall in pressure postoperatively (original level subglaucoma)	2

Two other recent series have found glaucoma in 31 percent,[13] and in 30 percent.[14] Swan and Raaf[20] stated that glaucoma may be a major factor in the blindness that gradually seems to develop in many of these patients if the condition is untreated.

There appear to be two types of secondary glaucoma represented in the series. In the first, venous back pressure incident to the disease causes an elevation in intraocular pressure prior to treatment. Four such cases in the group responded to treatment. In one, the use of pilocarpine normalized the tension; in three, the pressure returned to normal levels after successful neurosurgical treatment. The second type of glaucoma follows unsuccessful response to surgical treatment, with subsequent blindness and a rising tension, and it is usually associated with the late formation of a cataract. Three patients exhibited this type, and in all three vision failed after treatment, and absolute secondary glaucoma and cataract formation followed. In addition, two other patients with significant pressure differences between the two eyes preoperatively showed a definite lowering of tension after treatment although the original measurements were of a subglaucoma level.

Ophthalmodynamometer readings were obtained sporadically in only four of the patients, none serially. The only reliable finding was that of a pressure difference between the two eyes with a lower reading on

the operated side. It is hoped that other workers in this field may be stimulated to use this instrument for further studies, since it is likely that the available collateral arterial supply to the involved eye could be evaluated as a guide to successive steps in the surgical management.

Effects of treatment

The effects of treatment may be gauged by the regression of the ocular symptoms and signs. Five of the patients with simple cervical ligation had some regression of the ocular findings, such as reduction of the proptosis, but none of them recovered completely. Of the eight patients who survived the combined cervical and intracranial operations there was only one whose ocular condition completely returned to normal. Two others treated by prompt simultaneous cervical and intracranial operations had remarkable regression of proptosis with only minimal residuals. Two developed blindness, with subsequent secondary glaucoma and cataract formation in the involved eye, although in one of these the visual loss was severe owing to the original head trauma. In the other three patients who had the combined cervical and intracranial procedure, the surgery was performed in two stages, the cervical ligation being followed by the intracranial approach after an interval varying from three months to one and one-half years. In none of the latter did the affected eye return to normal.

It is interesting to study one measurable factor as an index of the effectiveness of treatment. Both preoperative and postoperative exophthalmometer measurements were available for nine patients of the series. The difference between the two eyes rather than the individual measurement for each eye may be used as an index of the relative proptosis. The results of treatment are presented in Table 1.

It should be noted that the residual proptosis was uniformly much less after the combined procedure, and that delay between the cervical and intracranial ligations produced less effect than simultaneous combined ligation. In all the combined procedures the ophthalmic artery was also clipped. Three of the last five cases listed had complete or nearly complete cure, and the preoperative and postoperative appearance of one is shown in Figures 4 to 7. One had immediate blindness postoperatively, and one died as a result of other sequelae of a severe head injury. It is encouraging to find in a recent paper that Walker and Allègre[15] reported cure of exophthalmos in nine of 11 patients where combined treatment was

TABLE 1

Reduction in proptosis with treatment
(nine patients)

Preoperative Difference (mm.)	Treatment	Postoperative Difference (mm.)
7	Common carotid ligation	4
8½	Cervical internal carotid ligation	4
9½	Cervical internal carotid ligation	9
9	Cervical internal carotid ligation; 3½ months interval; intracranial ligation*	5
11	Cervical and intracranial internal carotid ligation*	2
6½	Gradual cervical internal carotid occlusion 1 week, then combined cervical and intracranial ligation*	2
8	Cervical and intracranial internal carotid ligation*	2½
10½	Cervical and intracranial internal carotid ligation*	1†
4½	Cervical and intracranial internal carotid ligation*	1

* Ophthalmic artery also clipped intracranially.
† Measurement 1 mm. less than in normal eye.

Fig. 4 (Henderson and Schneider). Preoperative appearance of a patient with a traumatic carotid-cavernous fistula. The arteriogram is demonstrated in Figure 3.

used, although exophthalmometer readings were not presented.

In order to evaluate the necessary treatment of patients with carotid-cavernous fistula, one must first decide what the aim of therapy should be. It is known that approximately five to 10 percent of the lesions will heal spontaneously, probably by thrombosis. This probably occurred in the one case of the present series where symptoms subsided after arteriography. If symptomatic relief of the bruit and partial regression of proptosis is the only objective, then simple ligation of the cervical internal carotid artery may be adequate. Ligation may be accomplished in young people after applying the Matas test with compression of the vessel in the neck for 30 minutes, and, if no abnormal neurologic sequelae are noted, acute ligation of the artery may be performed. However, in older patients gradual occlusion of the artery over a period of days may be preferable before ligation.

It should be stressed that this approach, although achieving some relief, such as disappearance of the bruit, may not necessarily accomplish a desirable result for there may still be troublesome ocular problems and an unsightly cosmetic result. The longer the carotid-cavernous fistula remains patent, the more opportunity it has to increase in size, the more the injected vessels thicken, and the more fibrous changes occur in the abnormally distended orbital and periorbital tissues. We believe that our best results were gained in the three patients who had early cervical ligation of the internal carotid artery with simultaneous intracranial clipping of the internal carotid and ophthalmic arteries. In all these patients the response of the proptosis was remarkable, and in one with secondary glaucoma the tension had normalized within 48 hours.

Fig. 5 (Henderson and Schneider). Same patient as in Figure 4. Note the conjunctival injection, fullness of the upper lid, and swelling over the angular vein.

The tendency to proceed cautiously, awaiting the result of one procedure before going to another, is probably a pitfall, for it permits irreversible changes to develop in the tissues which can never be corrected, thus preventing the patient from attaining complete recovery.

Recommendations

As a result of our experience and the analysis of the present series, we recommend aggressive attack on the problems of the patient with carotid-cavernous fistula, and suggest the following outline of treatment in a team approach undertaken by the neurosurgeon and the ophthalmologist:

1. Repeated neurologic examinations.

2. Serial ophthalmologic examinations, including funduscopic, visual field, and visual acuity records. Periodic measurements with the exophthalmometer, tonometer and ophthalmodynamometer should be done both preoperatively and postoperatively. The serial measurement of the retinal artery pressures is suggested as a guide to successive steps in surgical treatment.

Fig. 7 (Henderson and Schneider). Same patient as in Figure 6. Note the regression of the ocular signs.

Fig. 6 (Henderson and Schneider). Postoperative appearance of the patient shown in Figures 4 and 5. Treatment was by combined cervical and intracranial internal carotid ligation together with direct clipping of the ophthalmic artery.

3. Skull x-ray films to determine the possibility of fracture and its attendant direct damage to the cranial nerves.

4. Prophylactic tarsorrhaphy in patients with severe proptosis associated with damage to the trigeminal and facial nerves.

5. Bilateral carotid arteriograms independently, and then with occlusion of contralateral vessels to demonstrate the patency of the anterior communicating artery.

6. The use of the Matas test with 30 minutes of compression of the internal carotid artery prior to cervical ligation of the artery in young patients. In patients over 45 years of age gradual occlusion of the internal carotid artery should be done over a period of at least several days prior to its ligation.

7. Wherever possible early cervical internal carotid artery ligation combined with intracranial clipping of the internal carotid and ophthalmic arteries should be performed.

Summary

The ocular findings in a series of 17 patients with carotid-cavernous fistula have been presented. The onset was spontaneous in three patients, traumatic in 12. Impairment of vision was the most frequent entering complaint, with diplopia and headache only slightly less important. The most frequent findings were proptosis, retinal and conjunctival venous congestion, and an audible bruit. Objective visual loss was found in over half the patients. Pulsation of the globe and chemosis were notably less than in previous reports.

Ocular muscle palsies occurred in over half the patients, with the abducens most frequently involved. The results of X-ray examination are presented. Skull fractures were present in over one third, and arteriographic confirmation of the diagnosis was obtained in all but one patient. Severe visual failure was documented in four patients of the series, and visual recovery with treatment ensued in five.

The highest reported incidence in the literature to date was found for secondary glaucoma. This complication appeared to be of two distinct types, the first the glaucoma before treatment based on venous congestion, and the other a late glaucoma associated with blindness and cataract formation. The effects of various forms of treatment as gauged by regression of proptosis pointed to combined cervical and intracranial internal carotid ligation with clipping of the ophthalmic artery as the most promising procedure.

An outline for management of carotid-cavernous fistula patients in a team approach between the ophthalmologist and neurosurgeon has been presented.

University Hospital.

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THE PATHOGENESIS OF SOME ATYPICAL COLOBOMAS OF THE CHOROID*

BERTHA A. KLIEN, M.D.
Chicago, Illinois

The pathogenesis of the typical colobomas of the choroid has been understood since the painstaking work of v. Sicily[1] and of Koyanagi,[2] which demonstrated that in the embryos of colobomatous strains of certain animals an inherent tendency to overgrowth of the neural ectoderm at the edges of the fetal cleft prevents its closure.

It has been tempting ever since to suspect the neural ectoderm at fault in the pathogenesis of at least some of the atypical colobomas, such as those of the macula and of the upper half of the fundus.

Conspicuous lack of histologic material, and the great clinical resemblance of these defects to postinflammatory chorioretinitic scars have, however, induced most writers to abandon the "neuroectodermal" theories in favor of a "pathologic" theory, which assumes that these lesions result from an intrauterine chorioiditis acting at various stages of ocular development.

Mann,[3] in the revised 1957 edition of her book, *Developmental Abnormalities of the Eye*, still greatly favors the inflammatory origin of atypical colobomas, finding that "the great advantage of this theory lies in the fact that all types and gradations between them can be brought into line under one heading." She theorizes, however, in comment upon a clinical case (Menache[4]) in which a typical coloboma was observed in one eye and a macular coloboma in the other that "a patch of atypical differentation of the outer layer of the optic cup might occur anywhere, so that pigment would fail (or rather be represented by some other retinal tissue) and therefore the choriocapillaris also, with the result of a white patch in the fundus."

The following, from a teratologic point of view, profoundly informative Case 1 proves the applicability of the neuroectodermal conception of pathogenesis also for some of the atypical colobomas. It is interesting that phenomena, such as pigmentation and ectasia of the colobomatous area, both of which were considered by Mann stumbling blocks to the acceptance of the neuroectodermal theory, were present in this case of unquestionable primary developmental anomaly.

CASE 1

This white girl was born to healthy parents at the full-term of a second uncomplicated pregnancy. A sister, three and one-half years of age, was living and well. During the fifth month of pregnancy the mother was in a minor automobile accident and suffered a sprained ankle, otherwise there was no history of any disturbing events or illness.

* From the Department of Surgery, Section of Ophthalmology, The University of Chicago.

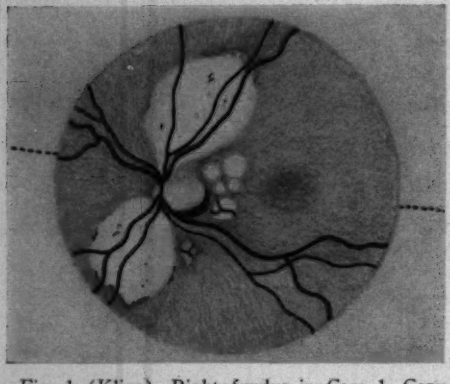

Fig. 1 (Klien). Right fundus in Case 1. Copy from color sketch by Dr. Mary Jane Fowler. Two large flat white areas above and below disc, six small whitish lesions, visible choroidal vessels within two of these. Optic disc ill defined below, sharply but irregularly defined and pigmented along upper border. Dotted line indicates plane of sectioning.

Two months after birth the child began to have convulsions several times a day. Neurologic and roentgenographic examinations did not reveal any obvious cause for them. The child's head was described as rather small and cerebral agenesis was suspected. Aside from a moderate degree of obesity the physical development appeared to be normal. The right thigh was the site of a flat pigmented nevus about 4.0 by 4.0 cm. in diameter.

The eyes appeared to be of normal size. There was slight left ptosis. Ocular motility was normal. The ocular media were clear. The pupils were regular, the right reacted sluggishly to light, the left was fixed. Ophthalmoscopic examination under general anesthesia revealed two large grayish white areas in each eye, one above and one below the disc, and additional well-defined small lesions, one in the left and six in the right eye (fig. 1).* The right optic disc was of horizontally oval shape, somewhat ill defined below and sharply but irregularly outlined and pigmented along its upper border. Its color was light pink. The retinal vessels were normal.

The ocular fundi was re-examined several months afterwards when some of the examiners were under the impression that a few of the whitish lesions had increased in size. The right eye was therefore removed with the tentative diagnosis of retinoblastoma.

At the age of one year and three months the child was admitted to a state institution. Her intelligence quotient was five. Four months later she died from bronchopneumonia.

The autopsy† revealed following status of the central nervous system:

"The brain weighed 576 gm. without the dura. It was small, and the leptomeninges over the frontal lobes were thickened. The cortical gyri were irregular in size and shape. Some of the frontal lobes were large. Large and undular masses were present in some gyri in the frontal lobes. Other gyri were divided by tiny sulci, giving rise to microgyria. The parietal and occipital lobes were smaller than the frontal lobes. The arachnoid over the interpeduncular space was thickened. The first cranial nerves were absent. The optic nerves were small. A large cyst with a smooth wall was present in the right lobe of the cerebellum. The corpus callosum was absent except for two folds extending along the medial border of the lateral ventricles. There was no septum pellucidum. The walls of the lateral ventricles were studded with many irregular nodules. The third ventricle was greatly dilated. Heterotopic gray masses were disseminated throughout the cortex, internal capsule and caudate nucleus. The islands of Reil were irregular and cut by many shallow sulci. No mamillary bodies were seen in the section taken behind the tuber cinereum. The cornu ammonis was hardly recognizable. A large depression occurred in the right occipital lobe. A large heterotopic mass was seen in the right hemisphere of the cerebellum.

"Staining revealed massive and numerous heterotopias, composed of ganglionic cells, for the most part, which were small and were not well supplied with Nissl substance, and glia, which consisted of both astrocytes and oligodendrocytes. The cortex was normal except where the heterotopias disturbed the usual structure.

"The cerebellar cyst was a simple cavity without a distinctive lining.

"In the medulla the pyramidal tracts were small and the fibers scanty.

"The diagnosis was: (1) cerebral agenesis with heterotopias, involving (a) absence of the olfactory bulbs and nerves, (b) absence of the corpus callosum, (c) absence of the mamillary bodies and (d) microgyria, and (2) simple cyst of the right lobe of the cerebellum."

The previously enucleated right eye measured 19 mm. in the sagittal direction. The corneal diameters were 10 by 10 mm. The eye was sectioned from below upward in a slightly oblique plane as indicated by the dotted line in Figure 1.

Histologic findings

The cornea was normal; the trabecular meshwork, the canal of Schlemm and the other structures of the angle of the anterior chamber showed normal structural and topographic development.

* The drawings of the fundi which made possible the correlation between the clinical and histopathologic findings in this case were made by Dr. Mary Jane Fowler.

† Courtesy of Dr. B. W. Lichtenstein.

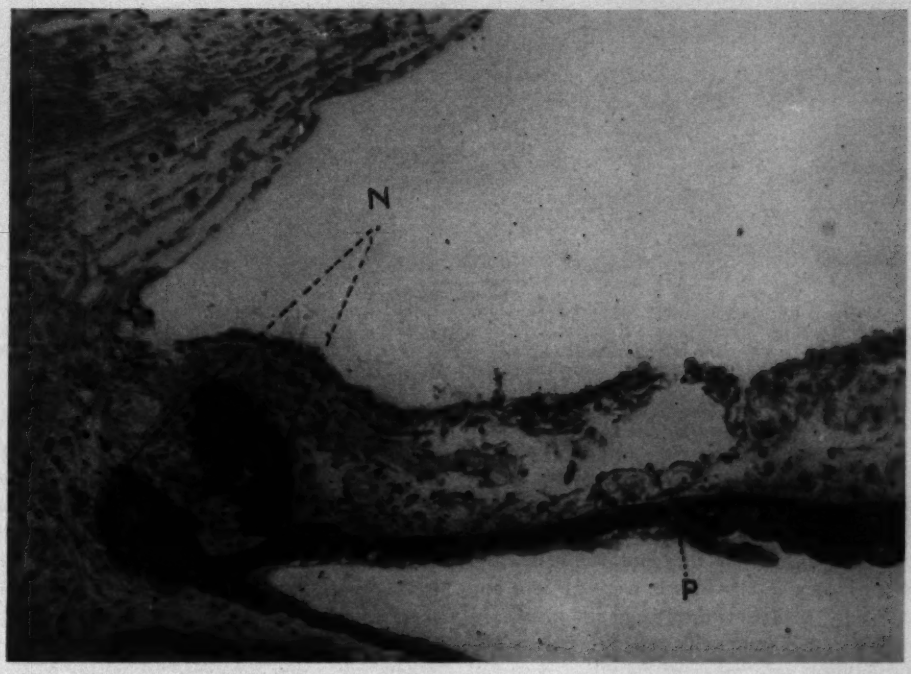

Fig. 2 (Klien). Case 1. Crenated pigmented epithelium of iris begins at (P). Up to this point posterior surface of iris is lined by two layers of epithelium of the appearance of ciliary epithelium. Folds of outer neuroectodermal layer indicated by hamartoma-like cell nests at (N).

The deeply pigmented crenated appearance of normal posterior epithelium of the iris did not begin at the root of the iris but one third to one half of the diameter of the iris further anteriorly (fig. 2). Up to this point the iris epithelium was nonpigmented and cubical, of the appearance of nonpigmented ciliary epithelium, and the outer neuroectodermal layer lacked differentiation into the cells of the dilator muscle. In many sections single or double "hamartomalike" cell nests were embedded in the stroma of the iris root (fig. 2) indicating folds of the outer layer of the secondary optic vesicle in these places (Klien[5]).

The lens was in situ. The ciliary body was normal with the exception of a circumscribed area in the temporal orbiculus region where the nonpigmented ciliary epithelium was differentiated into retina. Within this plaque well-differentiated ganglion cells, the two nuclear layers, an internal limiting membrane and a rudimentary neuroepithelium were discernible.

The most striking histologic findings were present in the posterior segment. The two large ophthalmoscopically visible grayish white areas and several of the small ones corresponded to colobomas of the choroid (figs. 3, 4, and 8). Within these areas of partial or complete choroidal failure the outer neuroectodermal layer was more or less extensively folded, being present in excess as compared to the inner layer (retina). It was undifferentiated in these regions and there was a lack of retinal coaptation in several places (figs. 3 and 4).

The folding of the outer neuroectordermal layer had led to the formation of cysts of partly pigmented (fig. 5) partly nonpig-

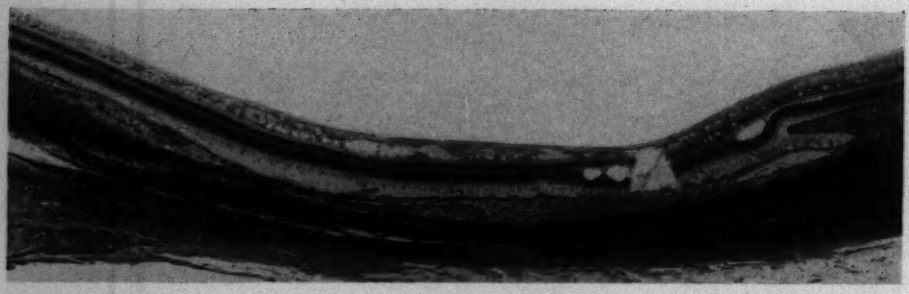

Fig. 3 (Klien). Case 1. Inferior coloboma of the choroid, clinically in "typical" location, but histologically revealed to have different pathogenesis from typical colobomas. Folding and lack of differentiation of outer neuroectodermal layer, partial failure of choroid and thinness of sclera, lack of retinal coaptation at edge of lesion.

mented epithelium (fig. 4), and to plaques of neuroglia (fig. 5) embedded in abortive choroidal tissue, testifying to the pluripotential properties of these cells.

In all of the colobomatous areas there was complete failure of the choriocapillaris but some larger ciliary vessels were present and clinically visible within some of them. In only a few circumscribed areas where a differentation into pigment cells had occurred there was also a rudimentary formation of choriocapillaris (fig. 5).

It is interesting that within the large colobomatous areas not only the choroid but also some of the sclera had failed. In these regions the sclera was thin and appeared to bulge backward due to the fact that its curvature followed not that of the retina, but in a general way that of the outer folded neuroectodermal layers.

Several of the small ophthalmoscopically noted light areas appeared to be due to lack of differentiation of the outer neuroectodermal layer into pigmented cells. Behind

Fig. 4 (Klien). Case 1. Superior, atypical coloboma of choroid. Irregular folding and lack of normal differentiation of outer layer of neural ectoderm with formation of cysts, failure of choroid and thinness of sclera in this region and extensive failure of retinal coaptation. Atypical coloboma of choroid due to fault in neural ectoderm.

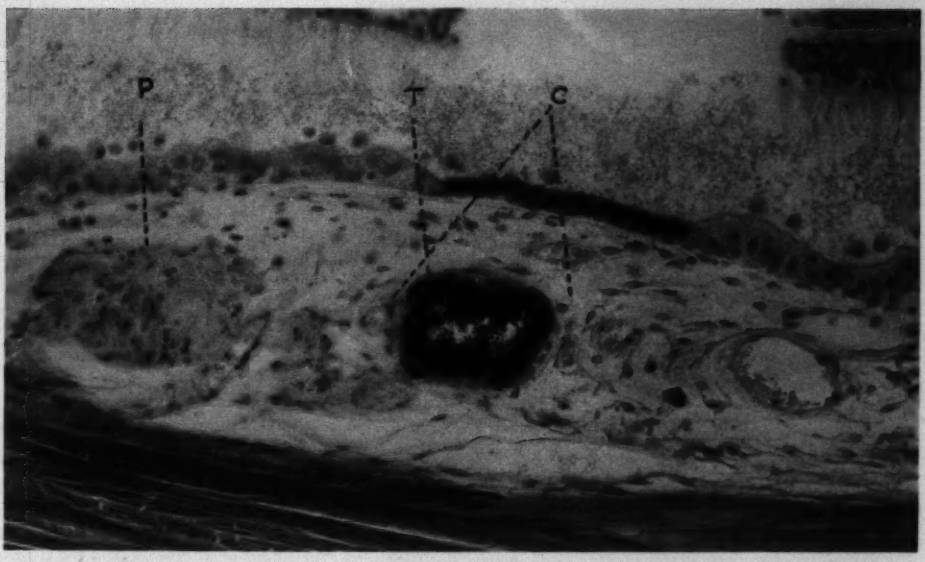

Fig. 5 (Klien). Case 1. Detail near temporal edge of superior atypical coloboma of choroid. Glial plate (P) and tubule (T) of pigmented epithelium embedded in abortive mesodermal (choroidal) tissue. Note capillaries (C) around pigmented epithelial layer, absence of Bruch's membrane.

these stretches of primitive cells there was irregularly vascularized mesoderm without the structural characteristics of normal choroid (fig. 6), while around them the choroid was well developed.

The retina appeared to be normal everywhere excepting over the large choroidal colobomas where there was lack of coaptation, extensive microcystic degeneration of the inner layers, and considerable degeneration of the rods and cones. There was no trace of Lange's fold at the ora serrata. The macula and fovea centralis were well differentiated.

The central and inferior portions of the optic nerve were normal aside from some irregularity of the cribriform plate throughout. In the upper third there was a certain amount of aplasia surrounding one large defect in the nature of a congenital pit (groove). At this place a pocket, which opened with a narrow funnel into the physiologic excavation (fig. 7) had replaced the nerve tissue and interrupted the cribriform plate. This pocket was filled partly with nonpigmented glial tissue, partly with convolutions and tubules of pigmented epithelium (fig. 8).

CASE 2

A girl, 16 years of age, had incidentally discovered poor vision in her right eye.

The right vision was 4/200, the left vision 20/15. The right anterior segment and the left eye were normal in every respect. The right fundus (fig. 9) showed a normally colored optic disc which was partly covered by a funnel-shaped, semitransparent structure. The retinal vessels, which otherwise were normal, were drawn at their entrance toward the temporal half of the disc by this funnel which may represent the proximal ending of Cloquet's canal.

In the macula there was a whitish defect outlined by pigment and measuring 1.0 by 1.5 disc diameters. Its center was occupied by a reddish, vascularized elevation with smooth outline and surface and the appearance of a hemangioma.

The most probable pathogenesis of these lesions is an intrauterine chorioretinitis which occurred before the third fetal month, probably a not uncommon origin of so-called macular colobomas (Mann).

One can only speculate about the origin of the hemangioma. Figure 10 shows one of several capillary hemangiomas incidentally found in the folds of an orbital cyst attached to the

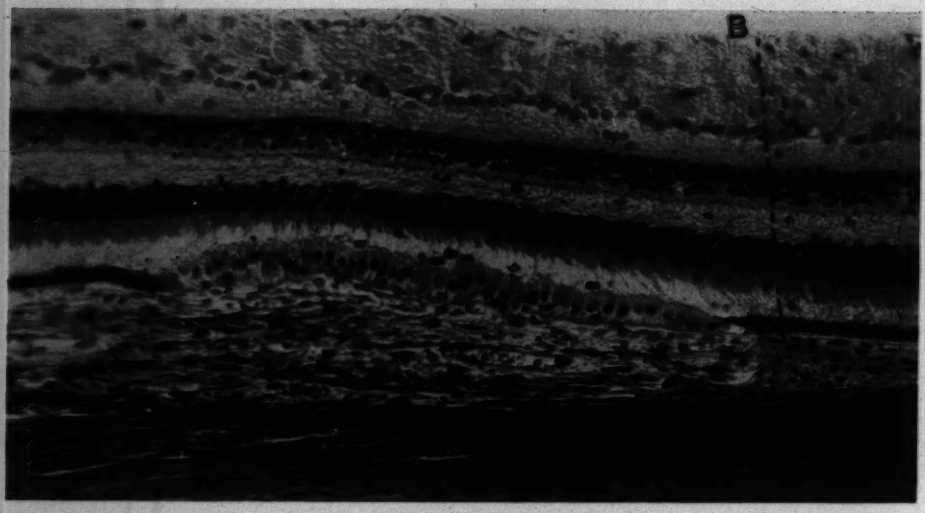

Fig. 6 (Klien). Case 1. Circumscribed area of faulty differentiation of pigment epithelium, absence of Bruch's membrane, irregularly vascularized mesoderm behind it. Well-defined Bruch's membrane (B), choriocapillaris and normal choroid adjacent to it, behind normally developed pigment epithelium.

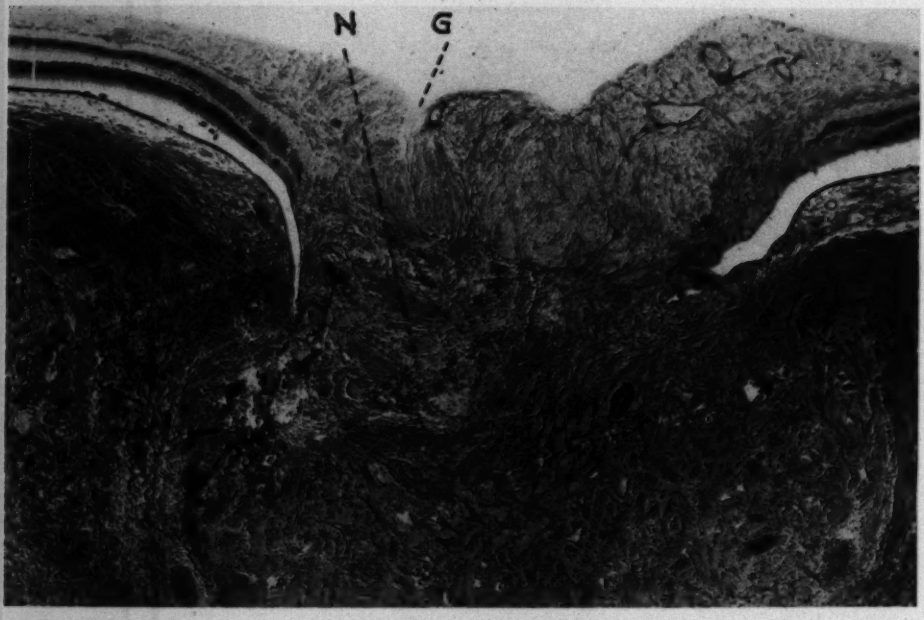

Fig. 7 (Klien). Case 1. Section through optic papilla just above center. Congenital groove (G), non-pigmented glial tissue (N) and pigmented convolutions filling gap in cribriform plate behind it.

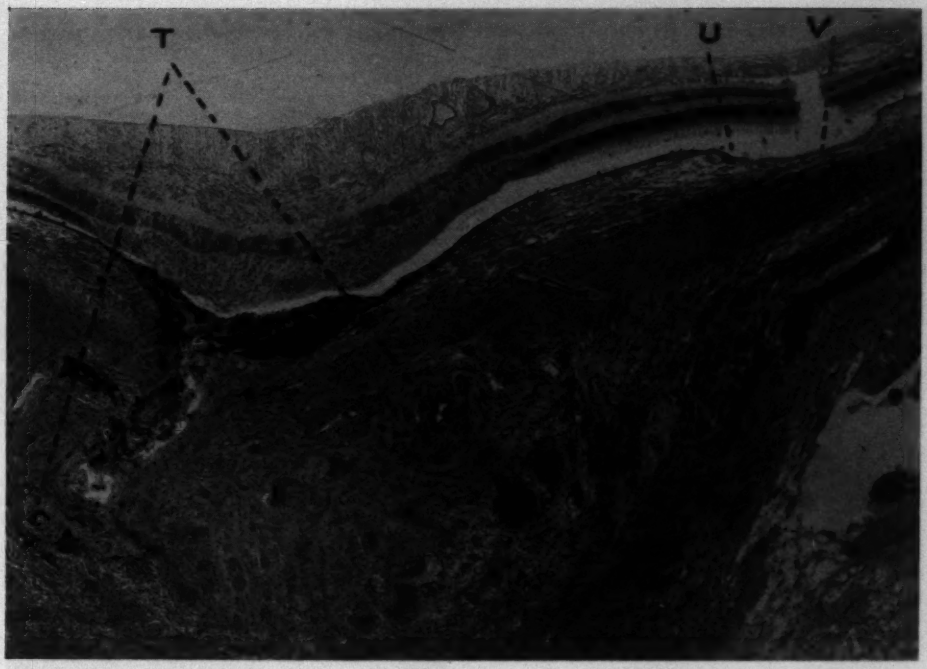

Fig. 8 (Klien). Case 1. Section through optic papilla at its upper edge. Folds and convolutions of pigment epithelium, pigmented tubules (T) embedded in tissue around nerve. Partial coloboma (groove) of optic nerve due to folding of outer layer of neural ectoderm. Small areas of undifferentiated pigment epithelium (U) with failure of choroid behind it. Presence of some large vessels (V) in this area, also visible clinically, but no choriocapillaris: Atypical coloboma of choroid due to fault in neural ectoderm.

left microphthalmic eye of a 23-months-old child. With the rivalry between mesoderm and neural ectoderm existing during most of the fetal development of the eye, the finding of an incidental isolated hemangioma should not be too surprising. One also has to remember that the optic cup shares the capillary vascularization which occurs on the surface of the central nervous system before the seven-mm. stage. Around the optic cup this capillary layer normally undergoes complete involution again, but it is conceivable that in the presence of developmental anomalies of the neural ectoderm, portions of this capillary net could persist and form isolated hemangiomas in close proximity to the end-results of the neuroectodermal malformations such as orbital cysts, typical and atypical colobomas, and so forth.

CASE 3

This small coloboma of the choroid in a typical site was found in the otherwise normal right eye of a 20-year-old woman (fig. 11). There was considerable ectasia of the sclera within the coloboma. Below it a rather light coloring of the fundus and marked visibility of the choroidal vessels suggested an adjacent abortive choroidal coloboma of greater extent.

While the most likely pathogenesis of such a coloboma is the usual one of overgrowth of the inner layer of the cup at the edge of the cleft, there exists the possibility, considering the findings in Case 1, that such circumscribed defects could also be due to localized imbalance of growth of the two layers of the cup with subsequent folding of the outer layer in this place and failure of the choroid, with or without scleral ectasia.

Fig. 9 (Klien). Case 2. Atypical (macular) coloboma of choroid, probably of inflammatory origin. Smooth elevation within it suggesting hemangioma. Note traction of vessels on disc temporalward by tissue indicating posterior ending of Cloquet's canal.

CASE 4

This was the left eye of a woman, 66 years of age, which was removed because of a malignant melanoma of the choroid in the inferior temporal periphery. The corrected vision of this eye was 20/60 at the time of enucleation. The vision of the other eye had been lost from a retinal detachment and a subsequent complicated cataract two years prior to the enucleation of the left eye.

It is interesting that the enucleated eye had a congenitally myopic configuration throughout and also showed a congenital groove (pit) of the optic nerve (fig. 12), two conditions which point to a primary overgrowth or unbalanced growth of the neural ectoderm.

The groove represented a partial coloboma of the nerve, which was replaced by a pocket containing nonpigmented neuroglial tissue and extending through a defect in the cribriform plate well back into the nerve in an axial direction. It suggested a fold of either the inner or outer layer of the optic cup in the region of the primitive epithelial papilla. Either layer, their cells being pluripotential, could have produced the nonpigmented cells present in this case, or the pigmented tissue, such as predominated within the defect of the optic nerve in Case 1 (figs. 7 and 8).

The pocket in Case 4 had a narrow entrance, opening in a slightly oblique direction upon the bottom of the physiologic excavation, which would have produced clinically the characteristic shadowy, grayish appearance of such congenital pits.

COMMENT

Faulty differentiation of the outer layer of the optic cup, suggested by Mann as a possibility for the origin of atypical colobomas accounted for some of the smaller lesions in Case 1. Such lack of normal differ-

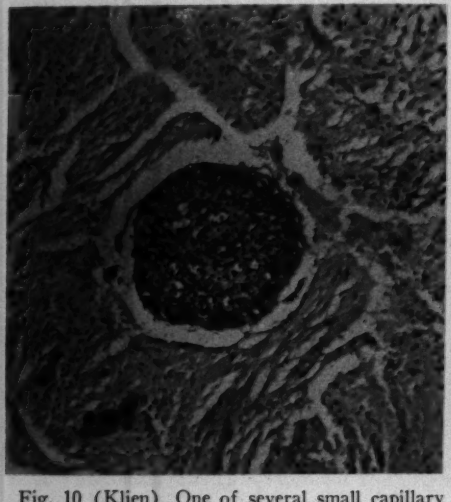

Fig. 10 (Klien). One of several small capillary hemangiomas found between the folds of an orbital cyst continuous with open cleft of a microphthalmic eye.

Fig. 11 (Klien). Case 3. Circumscribed coloboma of the choroid in typical location along former fetal cleft.

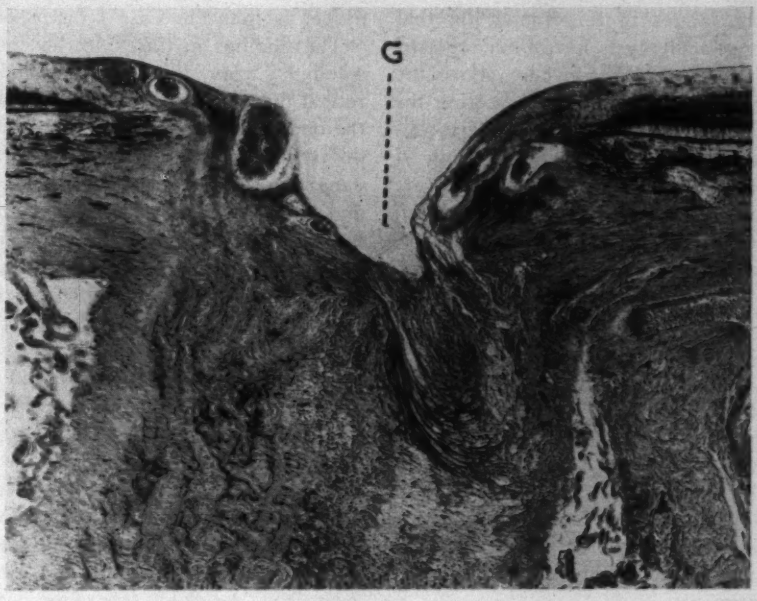

Fig. 12 (Klien). Case 4. Congenital pit (groove) (G) in optic nerve. Pocket of nonpigmented glial tissue filling defect in cribriform plate.

entiation of the outer layer of the cup in an area not connected with the fetal cleft has been demonstrated by Seefelder[6] in a chicken embryo. Only traces of the choroid were present behind it.

In the pathogenesis of the two large colobomas in Case 1 not only faulty differentiation but folding of the outer layer of the optic cup played a major role. This folding, which was evident in many regions in the upper and lower halves of the fundus and as far forward as the region of the iris root (fig. 2), could have resulted either from an inhibited growth of the inner layer of the cup, namely, the opposite of the overgrowth of this layer responsible for the typical colobomas, or from an overgrowth of the outer layer of the cup, or from an unbalanced growth of the various regions of the inner and outer layer of the cup in relation to each other. The normal size of the eyeball is perhaps suggestive of the last mentioned possibility.

It is interesting that the inferior coloboma, if encountered alone and only clinically, would impress one as a typical coloboma although histologically its pathogenesis was revealed to be different from the usual overgrowth of the inner layer of the neural ectoderm at the edge of the cleft.

Etiologically it differed in no way from the large upper, obviously atypical coloboma. Behind both of them there was an apparent backward bulging of strikingly thin sclera, which was not an acquired ectasia, since across both colobomas stretched an intact well differentiated, noncoadapted retina, but an accompanying failure of the mesoderm.

The difference between the superior and inferior coloboma consisted of a more extensive lack of retinal coaptation over the superior coloboma and of a cyst formation at its upper edge (figs. 3 and 4). The latter reminds one of the schematic illustration in Mann's textbook (fig. 51) of a cyst arising from the outer layer of the cup in its upper

half. Mann states in this connection that "very occasionally cysts have been reported attached to the eye somewhere above the insertion of the optic stalk and bulging the upper lid. None of these cases has been subjected to microscopic examination, but if they do occur it seems possible that they are caused by localized dilatation of the cavity of the optic vesicle. Nothing is known as to whether they are lined with pigment epithelium or with inverted retina. They might also possibly be cysts of the cleft region which have bulged upwards instead of backwards."

A third possibility is suggested by Case 1, that is, a markedly unbalanced growth of the two layers of the optic cup. While there is a vast difference in the size of the cysts in these clinically reported cases and of the microscopically discovered cysts in Case 1, the difference may be only one of degree and not of principle.

Throughout the intrauterine growth of the eye the growth rate of the inner layers differs in various regions and also in relationship to the outer layers to which it has finally to adapt itself. Overgrowth, inhibited growth, or unbalanced growth of part or of all of these layers must lead to defects such as persistent folds and typical colobomas, failure of coaptation and, as seen in Case 1, to folding of the outer layer. This, in turn, may result in cyst formation or in pigmented and nonpigmented tubules and convolutions of more or less differentiated neural ectoderm embedded in or replacing the rudimentary respectively missing choroid, which has failed in varying degrees in these places.

Similarly, defects in the optic nerve may be produced by folding of the outer or of the inner layer of the optic cup at the edges of the primitive epithelial papilla, resulting in pockets of nonpigmented, abnormally differentiated tissue such as were demonstrated by Seefelder,[7] and above in Case 4, or producing pits partially filled with convolutions and tubules of pigmented neuroectodermal tissue, as found in Case 1 discussed above.

The findings in Case 1 throw interesting side-lights also upon the independence of retinal differentiation from the condition of the outer layer of the cup. The retinal cells differentiate from the inside outward, the ganglion cells and nerve fibers being the first and the percipient retinal elements being the last to develop. This differentiation occurs as an inherent tendency regardless of any abnormal events taking place in the outer layer of the neural ectoderm, but the function and future fate of the normally differentiated retinal elements depend upon coaptation with a normally developed pigment epithelium. Thus one could see in this case varying stages of degeneration of the rods and cones and microcystic degeneration of the outer nuclear and plexiform layers where lack of retinal coaptation and failure of the pigment epithelium and choriocapillaris has deprived otherwise well-differentiated retina of proper nutrition.

Summary and Conclusions

Histologic evidence has been presented and discussed proving the origin of some atypical colobomas of the choroid as neuroectodermal malformations. Two basic developmental anomalies of the neural ectoderm were found responsible for them, namely, faulty differentiation, and imbalance of growth in various portions of the outer and inner layer of the optic cup.

The rare orbital cysts attached to the upper half of the globe and bulging the upper lid may have a similar pathogenesis.

These atypical colobomas of neuroectodermal origin are briefly contrasted on the one hand with an atypical coloboma of the choroid of almost certain inflammatory pathogenesis, on the other hand with a circumscribed coloboma of similar appearance but probably different, typical etiology, in the usual location along the site of the former fetal cleft.

Two cases of congenital pit formations or partial colobomas of the optic nerve were

discussed, one occurring together with the atypical colobomas of the choroid of neuroectodermal origin, the other, significantly, occurring in an eye with congenital myopia. Their appearance in the form of pockets filled with pigmented or nonpigmented neuroectodermal tissue at various stages of differentiation, suggested their origin from abnormal folds of the inner or outer layer of the optic cup adjacent to the primitive epithelial papilla.

2615 East 76th Street (49).

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THE ETIOLOGY OF SENILE ENTROPION*

Sidney A. Fox, M.D.
New York

As far back as memory can recall there has been a clinical entity seen in elderly people in which the margin of the lower lid turns inward and which has been called spastic entropion. Recently this term has been diluted and modified somewhat to senile spastic entropion. Rarely has it been called, as it should, senile entropion (Duke-Elder[1]).

No one has ever explained accurately what initiates the spasm in spastic entropion, along what arcs it travels or why and how it is confined to the upper three or four millimeters of the lower lid. But "spastic" it remains. Many etiologies have been assigned to this spasm: (a) Irritation of the cornea or conjunctiva, (b) spasm of the muscle of Riolan, (c) malposition of the insertions of the canthal ligaments, (d) spasm of the marginal fibers of the orbicularis, and so forth.

It is not hard to dispose of most of these theories:

a. A half dozen drops of pontocaine dropped into an entropic eye will abolish all surface irritation but the entropion will remain (fig. 1A).

b. A look at any good anatomy book will show that the muscle of Riolan lies mostly on the *posterior* portion of the *lid margin* in the neighborhood of the openings of the meibomian glands and is distinct from the fibers of the orbicularis. It is a weak, scrawny muscle, too feeble to do any bending, spasm or no spasm.

c. If this type of entropion is due to malinsertion of the canthal ligaments, why does it show up only in the loose, atonic lids of elderly people; never anywhere else?

d. Then how about the possibility of spasm of the marginal orbicularis fibers initiated in some apochryphal way after the efferent fibers leave the conjunctiva? It is difficult to explain a spasm so localized, so selective and

* From the Department of Ophthalmology, New York University Post-Graduate Medical School and the Eye Service, Bellevue Hospital.

Fig. 1A (Fox). Entropion of the left lower lid after anesthesia of the conjunctival sac.

so specialized that it affects only the border fibers of the orbicularis while the rest of the lower lid remains uninvolved. Furthermore, there is little in the neurologic anatomy of the lower lid to bolster this theory. However, to rule out even the slightest possibility, the following experiment was performed:

After complete anesthesia of the conjunctival sac of an eye with entropion (fig. 1A) an O'Brien akinesia was performed, care being taken not to approach the lid area. Despite the fact that both the efferent and afferent fibers were blocked out the entropion persisted (fig. 1B). It will be seen that innervation to the left lower lid was blocked out as the patient was unable to close his left eye when asked to squeeze his eyes shut although the right eye is tightly closed. Yet the left lower lid remains turned in. On the operating table with the patient lying down this effect is even more striking. So much for spasm.

Fig. 1B (Fox). The same lid after an O'Brien akinesia. Note that the entropion persists.

If it isn't spasm then what causes the entropic lid to turn in? There are a number of anatomic and physiologic factors which make for entropion in the senile eye but the most important one has been much overlooked. Senile relaxation of the skin and muscle of the lower lid is always a factor, some absorption of orbital fat with retroplacement of the globe also plays a part, the fact that the tarsus of the lower lid is comparatively thin and narrow is important and anophthalmos and enophthalmos are always predisposing factors.

But the most important fact of all is that the lower lid is hung on a tough fibrous sling. This is composed of the tarsus and a canthal ligament at each end which molds the lower lid against the globe much more tautly than senile skin and muscle. This is due partially to Horner's muscle (tensor tarsi) but also is it due to the insertion of the canthal ligaments behind the plane of the tarsus.

Thus, given a relatively intact tarso-ligamentous sling, when the lower lid rides up during the normal blinking process, the loose, flabby skin and muscle will allow the lower border of the tarsus to swing forward, away from the eyeball, the upper border will turn inward on the sling as on a fulcrum and the result is senile entropion. Anyone who has asked a patient suspected of entropion to squeeze his lids together has seen this happen.

This is not spasm, it is a senile lid with a relatively normal tarso-ligamentous skeleton. Absorption of orbital fat with retroplacement of the globe, enophthalmos, anophthalmos, and so forth, will also help create entropion but there must be a relatively intact tarso-ligamentous sling in a loose, flabby lid for senile entropion to occur. If the tarso-ligamentous sling were also loose the patient would have ectropion instead of entropion, but that's another story.

(In a sense, the situation here resembles somewhat that in cicatricial entropion in which the ratio of skin-muscle to tarsoconjunctiva has changed due to reduction of tarsoconjunctiva by cicatrization. In senile entropion the proportion is also altered but here it is due to an *increase* by stretching of the skin-muscle layer vis-à-vis the tarsoconjunctiva. Of course, all similarity ends there.)

Correction of senile entropion

The correction of senile entropion has always been a problem. This has probably been due to a large extent to uncertainty as to its etiology. In addition to irritation, spasm, malinsertion of the canthal ligaments, and so forth, it has also been confused with trichiasis. Thus no less an authority than the *American Encyclopedia of Ophthalmology*[2] states that "entropion is an exaggerated degree of trichiasis" and "as it is clinically impossible to separate trichiasis from entropion these two subjects are treated in one section." The same operative procedures are suggested for both.

Needless to say the modes of repair suggested over the years have been myriad and will not be enumerated here. The failures lagged somewhat behind, but not far. It wasn't until Wheeler[3] in 1938 suggested strengthening the orbicularis that a solution of the whole problem began to emerge. He showed that cautery and the excision of horizontal strips of skin and muscle were doomed to failure. In 1948 Butler[4] in a paper which did not receive sufficient recognition stressed the importance of lower tarsal border relaxation in the etiology of this type of entropion and suggested the resection of an apex-up triangle from the lower border of the tarsus to correct it. In two papers published in 1951 and 1952, I[5] suggested that the underlying pathology here was not spasm but the degenerative processes of senility and proposed vertical resection of tarsus, skin and muscle to strengthen the lower lid horizontally.

Duke-Elder[1] states that in senile entropion

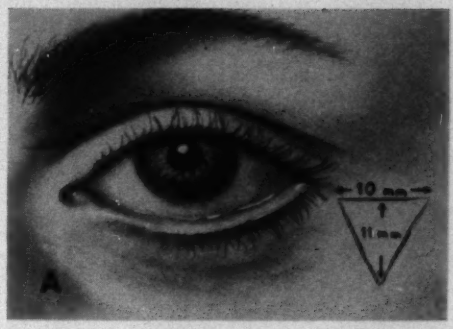

Fig. 2A (Fox). Just below and lateral to the external canthus a triangle apex downward, measuring 10 mm. to 12 mm. at the base and approximately 12 mm. vertically is marked out with an antiseptic dye.

(sic) "the lower lid is frequently so lax and flabby that it has to sag in one or other direction: if the orbicularis retains a reasonable amount of tone it will tend to sag inwards, more particularly if the skin is atrophic and redundant and the eye has become deeply placed."

In 1953 Kirby[6] also suggested resection of skin and shortening of the tarsus at the external canthus in order to correct "the flaccidity and elongation of previously dense fibrous and elastic tissues of the lower lid in the condition of senile degeneration. . . ."

Based on the above thinking the following technique has been evolved over the past nine years.

Fig. 2B (Fox). The included area of skin and muscle is resected.

Fig. 2C (Fox). The lid is everted on a small chalazion clamp and a triangle of tarsoconjunctiva, apex upward, measuring six to eight mm. at the attached tarsal border is resected.

Fig. 2E (Fox). The tarsus is closed with interrupted 4-0 black silk sutures. The external triangle is closed as follows: The muscle with 4-0 catgut and the skin with 5-0 black silk.

SURGICAL TECHNIQUE

Two or three mm. lateral to the right external canthus a triangle apex downward, measuring about 10 mm. at the base is marked off with an antiseptic dye (fig. 2A). If the entropion is severe and long-standing the base line may be made 12 mm. long. The apex of the triangle should be about 12 mm. below the center of the base line. The whole lid is anesthetized and the included skin and muscle resected (fig. 2B).

The lid is then everted on a chalazion clamp and a triangle with apex at the free border is marked off on the conjunctival surface of the tarsus. This should be just lateral to the center of the lid, with the base at the attached tarsal border measuring six to eight mm. depending on the severity of the entropion (fig. 2C). The tarsoconjunctival triangle is resected, the lateral edge of the tarsal wound is then raised and the tarsoconjunctiva of the lateral half of the lid is separated from the skin-muscle lamina all the way from the lid border down to the lower orbital rim and laterally until the points of the scissors emerge in the lateral wound (fig. 2D). The object of this dissection is to free skin-muscle from tarsoconjunctiva so that they glide over each other without causing skin wrinkles on closure.

The tarsal wound is closed with three or

Fig. 2D (Fox). The skin-muscle and tarsoconjunctival laminae between the two incisions are split from each other from the lid border down to the lower orbital margin.

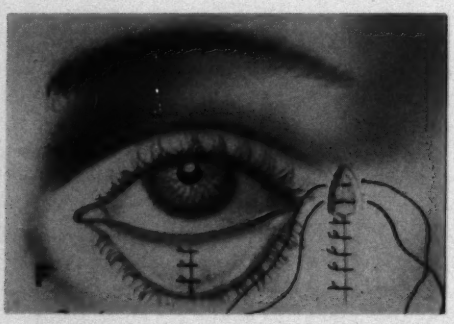

Fig. 2F (Fox). If a skin pucker forms above, a triangle of skin is resected and also closed.

four interrupted 4-0 black silk sutures. The skin-muscle triangle at the external canthus is closed with 5-0 black silk sutures, care being taken to catch up the muscle fibers as well. Alternatively the muscle may be closed separately with 4-0 plain catgut and then the skin with 5-0 black silk. If a wrinkle should form at the top of the wound (figs. 2E and 2F) a small skin triangle is excised and the wound closed with black silk.

Following surgery a firm supportive dressing is applied. Further dressings are done at two-day intervals unless the cornea needs inspection oftener. Skin sutures are removed in six days and tarsal sutures in 10 days unless obviously loose before then.

This operation has been performed by me or under my supervision in more than 150 cases with a recurrence rate which is lower than in any other procedure previously used. Its advantages are:

a. The surgery is simple.

b. It strengthens the tarsus at the base where most needed and tautens the whole lid horizontally.

c. There is little resultant scarring.

d. In case of recurrence it may be repeated easily. And there will be recurrences; though fewer than with other procedures. The reason for this is self-evident: Senile entropion is a product of the aging process; this process goes on as long as the patient lives. Hence the longer he lives the greater the chance of recurrence.

Summary and Conclusions

1. It is the thesis of this paper that senile ("spastic") entropion is the result of the same senile degenerative process as senile ectropion.

2. The difference in the two clinical entities is the maintenance of a relatively intact tarso-ligamentous sling in entropion.

3. Repair is best made by strengthening all the tissues of the lid horizontally by vertical excision.

4. A simple technique to accomplish this has been outlined which in my hands gives fewer recurrences than any other procedure.

5. Since senile entropion is not a pathologic entity but a result of the aging process, probably no procedure will effect a permanent cure in all cases; for as long as aging continues tissue degeneration will proceed. An individual gets older the longer he lives —for this there is no cure.

11 East 90th Street (28).

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HEMANGIOMA OF THE CHOROID: A CLINICOPATHOLOGIC ANALYSIS*

IRA S. JONES, M.D.
New York
AND
GILBERT W. CLEASBY, M.D.
San Francisco, California

Hemangiomas of the choroid are most often recognized when they form part of the symptom complex known as meningocutaneous (encephalotrigeminal) angiomatosis or Sturge-Weber syndrome.[1, 2, 5, 9, 10, 11, 15, 19, 25, 34, 40, 41, 43] When the symptom complex is only partial the diagnosis becomes more difficult and cases in which apparently the choroid alone is involved constitute a diagnostic problem of considerable dimensions. The incidental finding of isolated choroidal hemangiomas in eyes enucleated for other reasons has led to the feeling that many choroidal hemangiomas are not appreciated during ophthalmoscopic examination. Eyes containing these tumors are also frequently enucleated because of the suspected presence of a malignant lesion. Twenty-eight cases of hemangioma of the choriod in which the diagnosis has been proven microscopically have been gathered from the files of the eye pathology laboratories of the Columbia-Presbyterian Institute of Ophthalmology and the Stanford University Hospital in an effort to correlate clinical and pathologic features of these lesions. This study has been undertaken in the hope that appreciation of the distinctive characteristics of these tumors will lead to greater accuracy in diagnosis.

It has been assumed that choroidal hemangiomas fall into two separate categories, one in which the genesis is a central nervous abnormality generally following the distribution of the trigeminal nerve and involving the embryonic vascular supply to the choroid and meninges, and the other group being isolated choroidal hemangiomas without associated abnormalities elsewhere.

Several authors, on the basis of analyses of cases in each category, have considered that all lesions belong to the same group. Among those holding this view are Berliner and Breinin,[5] Fuchs,[20] and Stokes.[44]

The complete Sturge-Weber syndrome consists of ipsilateral facial, choroidal and meningeal hemangiomas with glaucoma in the affected eye and irritative symptoms from the cerebral involvement. The facial manifestation is usually a "port-wine" mark or nevus flammeus which consists of mature telangiectatic vessels. The conjunctival and episcleral vessels may also be angiomatous. The intraocular changes may consist of dilatation and proliferation of vessels in the choroid, iris or anterior chamber angle. The choroidal involvement may be sufficiently exuberant to constitute a tumor. The meningeal manifestations consist of telangiectasia of a variable thickness with irritation of the subjacent cerebral tissue.

Various combinations of these features exist and, if cerebral manifestations are most prominent, the patient may never be subjected to ophthalmic examination. If the glaucoma predominates, the exigencies of its treatment and the nature of its complications may prevent an adequate search for choroidal lesions from being made. If both the cerebral and ocular features are minimal, the symptoms may be insufficient to bring the patient under medical observation. Berliner and Breinin[5] suggested that secondary glaucoma of either the infantile or the adult type was inevitable.

* From the Institute of Ophthalmology, Columbia-Presbyterian Medical Center, New York, and Stanford University Hospital, San Francisco. This work was supported in part by Special Clinical Traineeship No. BT290 of the National Institute of Neurological Diseases and Blindness, Bethesda, Maryland.

Joy[25] collected 200 cases of the Sturge-Weber syndrome, of which 23 were verified by microscopic examination. Danis[11] collected 82 cases of choroidal hemagioma verified histologically, 40 of which were associated with facial angioma. It appears from a perusal of the literature that approximately 250 cases of the Sturge-Weber syndrome have been recorded to date, and that about 100 choroidal hemagiomas, with or without facial angiomas, have been verified histologically. This presentation of 28 cases brings the latter number to approximately 128.

Clinical features

Clinical entities from which hemangioma of the choroid must be differentiated include malignant melanoma of the choroid, inflammatory mass, disciform degeneration and idiopathic retinal detachment. Distinguishing clinical features of hemangioma of the choroid include:

1. *Relatively young age of the patient.* Malignant melanoma of the choroid and disciform degeneration tend to occur in older patients, although exceptions do occur, especially in the so-called "juvenile disciform degeneration."

2. *Presence of facial nevus flammeus or angiomatous lesions elsewhere on the body.* Often this tumor may be associated with a fully developed Sturge-Weber syndrome, including facial and meningeal angiomatosis with Jacksonian seizures. When facial nevus flammeus is present, diagnosis of choroidal hemangioma is made much more certain. Such an association was present in 50 percent of the 54 cases collected by Rosen[40] and in 40 of the 82 cases collected by Danis.[11] In this series, seven of the 28 cases were associated with facial nevus flammeus. Similar angiomas may be seen on other parts of the body in association with choroidal hemangioma even in the absence of involvement of areas supplied by the first and second branches of the trigeminal nerve.[21, 34, 49]

3. *Location around or adjacent to the optic disc with a tendency for involvement of the macular area.* The tumor may extend forward, even to the ora serrata, in tapering fashion. However, in most cases the more prominent portion is near the optic nervehead.

4. *Circumscribed elevated mass.* The tumor is generally lens shaped or domelike with less sharply demarcated margins than are seen in malignant melanoma. The nature and contour of the lesion may be difficult to appreciate, especially when associated with retinal detachment. In this respect the strong light and stereopsis afforded by the binocular indirect ophthalmoscope are helpful.

5. *Color.* The color is generally grayish or yellowish, often associated with scattered patches of either black or yellowish-white appearance over the surface of the tumor. Occasionally the lesion itself has deeper areas of black or dark brown color. Melanomas are generally of a more uniform tan to dark brown color, although they may occasionally be yellow or gray also. Occasionally a hemangioma will have a pinkish hue at the apex, especially when viewed with focal illumination.

6. *Dilatation of ocular vessels associated with the lesion.* These may be seen in the retina or choroid close to the lesion, or as large episcleral vessels visible over the anterior portion of the eye.

7. *Cystic change of the overlying retina, especially in the macular area.* This can be best appreciated by retroillumination in the manner described by Reese and Jones,[39] either with a strong direct ophthalmoscope or with the slitlamp beam.

8. *Absence of inflammatory or irritative signs about the tumor.* Occasionally a moderate amount of dark pigmentation due to retinal pigment proliferation is present, but rarely to the extent seen with inflammatory lesions.

9. *Slow growth or progression.* The rapid changes seen in inflammatory lesions or the early phases of disciform degeneration are not characteristic of hemangioma. A malig-

nant melanoma of the choroid usually grows at a more rapid rate.

10. *Absolute hypermetropia.* When the lesion is located in or near the macular area, there is often a history of progressively decreasing visual acuity, accompanied by an increasing hyperopia in the involved eye.

11. *Retinal detachment.* Associated retinal detachment may not be present in the earlier phases of development, but is almost certain to result ultimately. The detachment may be small and localized, but tends to spread rapidly. The detachment may be total or inferiorly located, but is rarely confined to the superior portion of the fundus. The contour of the elevated retina is usually smooth and bullous, allowing good visualization of the underlying choroid with a strong light. Breaks or tears are not present, except as rare coincidental findings. In some cases of retinal detachment secondary to a choroidal tumor or inflammation, the phenomenon of "shifting fluid" is present to a prominent degree. This is manifested by a definite shift of the upper border of the detachment to a more superior position when the patient lies down. This can be ascertained by rapid comparison of position and configuration of the detachment when the patient is alternately sitting and lying. This phenomenon is often not specifically tested or noted, but in at least one of the cases in this series, it was present and commented upon by the examiner.

12. *Sector field defect.* Visual field examination classically shows a sector-shaped defect extending to the periphery,[13] but this has not been of much significance in this series. Only one case was reported to show such a finding.

13. *Secondary ocular changes.* Glaucoma, uveitis, cataract and corneal degeneration usually develop ultimately. This may take many years with smaller lesions, but tends to be earlier and more severe in the diffuse types, especially those found in association with the Sturge-Weber syndrome.[1, 2, 5, 9, 10, 11, 15, 19, 25, 34, 40, 41, 43] In younger patients with hemangioma of the choroid, especially in association with facial involvement, there may be enlargement of the globe without any measurable increase of intraocular pressure. It is almost inevitable, however, that later glaucoma does appear. It is possible that a low scleral rigidity may prevent earlier detection of the glaucoma by standard techniques of measurement. Intraocular hemorrhage is occasionally seen and is usually of minor proportions, giving rise to fine vitreous opacities. The hemorrhage seen in association with disciform degeneration is usually subretinal. Evidence is sometimes seen of massive bleeding in eyes enucleated because of severe secondary changes.[30] A history of trauma may occasionally be elicited in eyes found to have hemangioma of the choroid after enucleation.[51] This may be related to the increased tendency for severe hemorrhage in eyes harboring these tumors or to the possibility that trauma may stimulate the development of such lesions. There was a history of severe trauma in four patients of this series.

The 28 cases in this series included seven associated with facial hemangioma and in only one of these seven was there a clear-cut history of cerebral involvement with convulsive seizures. The primary diagnoses included: malignant melanoma of the choroid (eight cases), Sturge-Weber syndrome (three cases), "tumor" (two cases), blind painful eye (two cases), chronic inflammatory disease (one case), phthisis bulbi (one case), hemangioma of the choroid (two cases), acute glaucoma (one case), secondary glaucoma (one case), buphthalmos (one case), and absolute glaucoma (one case). A clinical diagnosis was not available in five cases. The average age at the time of enucleation was 35 years with a range from birth to 68 years. The average age at the time of first symptoms related to the lesion was 19 years with a range from birth to 65 years. Ten of the 28 patients were

Fig. 1 (Jones and Cleasby). (Path. No. 54–77.) This shows several large episcleral and transcleral vessels (A) associated with a hemangioma of the choroid (B). The tumor is demarcated by a heavy proliferation of choroidal pigment (C). The overlying retina shows cystic degeneration (D) in the area of adhesion to the epichoroidal membrane and adjacent detachment (E).

male, 13 were female, and the sex is not listed in five. Two of the individuals were Negroes. The initial symptoms or problems included diminished vision (19 cases), pain (six), trauma (three), inflammation (one), and infection (one). In some cases the first two symptoms were held in common. Glaucoma was present in 11 of 20 cases in which tension was reported. Retinal detachment was present in all but three cases either by clinical or microscopic examination.

Histologic features

Microscopic study of choroidal hemangiomas shows certain consistent features. In all specimens in this group, the lesion was situated in a position adjacent to or surrounding the optic nervehead. Eleven cases showed involvement of one half or more of the posterior segment, but with the thickest portion usually located near the disc. Seven lesions were confined to the macular area. Seven lesions showed diffuse involvement of the entire choroid.

The thickness of the hemangioma varied from the normal width of the choroid to seven millimeters. In a few instances the limits could not be determined because the interior of the eye was filled with disorganized material.

About one half of the cases showed large transcleral blood vessels under the tumor, frequently associated with adjacent dilated episcleral vessels (figs. 1 and 2). This finding, together with the usual posterior location of the hemangiomas, led us to feel that there might be a relationship to the short posterior ciliary arteries, the latter acting as feeder vessels.

The vascular pattern was quite uniform and consisted of dilated blood channels of variable size separated by connective tissue of a delicate nature (figs. 3 and 4). There have been varying opinions as to whether these hemangiomas should be designated capillary or cavernous.[24, 29, 37, 50] The usual appearance, together with the location in the area of large and medium sized choroidal

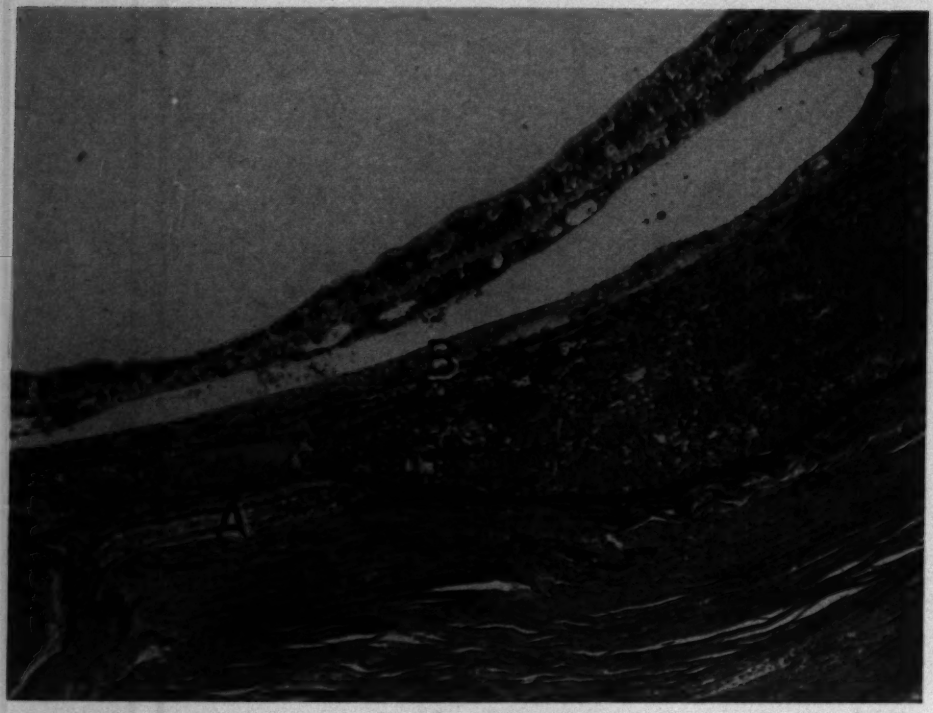

Fig. 2 (Jones and Cleasby). (Path. No. 54-77.) This is a higher magnification of the lesion shown in Figure 1. A large transcleral blood channel (A) feeds the tumor. The epichoroidal membrane (B) is rather thin and composed of fibrous tissue and retinal pigment epithelium.

vessels, suggest that they are of cavernous type. The frequent involvement of the macular area may well be correlated with the denser network of choroidal vessels in that location.

The presence of a layer of tissue between the involved choroid and the retina is a relatively constant histologic feature of hemangioma of the choroid[39] (figs. 5 and 6). In only seven cases was there no definite evidence of an epichoroidal layer or membrane interposed between the tumor and the overlying retina. This structure varied from only a disorganization of the retinal pigment epithelium and a thin strand of fibrous tissue to a thick layer containing bone, calcium, pigmentary proliferation and dispersion and fibrous tissue. Five eyes contained calcium and nine showed ossification in the epichoroidal membrane. The latter findings were more frequent in cases in which the history indicated that the process was of long duration. Bruch's membrane was thickened in most instances, and in two cases had proliferated to a thickness matching that of the hemangioma. In addition, drusen were usually present in the area immediately peripheral to the tumor. Quite frequently the overlying retina was adherent to and often blended with the epichoroidal layer (figs. 1, 3, 4, and 5).

The overlying retina in every case showed edema or cystic degeneration involving all retinal layers (figs. 1, 2, and 5). Similar changes were frequently seen also in areas not in direct contact with the lesion.

The retinal pigment epithelium in most cases showed disorganization and proliferation over the tumor (figs. 2 and 3). In five

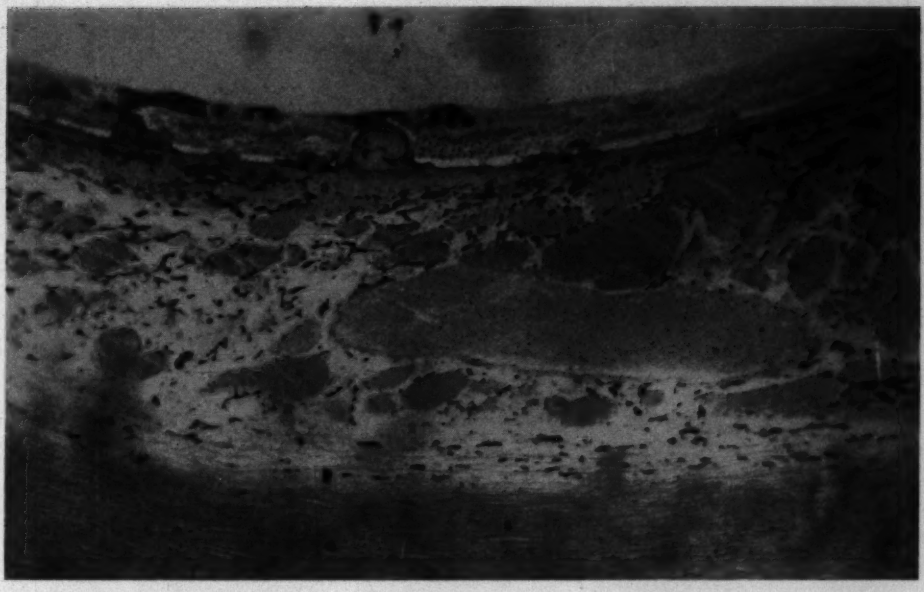

Fig. 3 (Jones and Cleasby). (Path. No. 6697.) This shows the variable-sized vascular spaces within the hemangioma separated by delicate strands of connective tissue. The adherent retina is blended with the epichoroidal membrane. Drusen and proliferated retinal pigment epithelium are prominent.

cases retinal pigment epithelial proliferation had actually extended into the tumor itself. This occasionally was more prominent than choroidal pigmentary proliferation, but in a few cases both types could be distinguished. Twelve cases showed choroidal pigment proliferation as the outstanding pigmentary feature (figs. 1, 5, and 6).

We feel that these features indicate that hemangiomas exert an irritative effect on the retina, perhaps supplemented by defective retinal nutrition from thickening of Bruch's membrane or proliferation of bone. In addition, it seems likely that the deposition of bone or calcium is a result of disturbed fluid and electrolyte transport in this area as well as metaplasia of the retinal pigment epithelium.

Retinal detachment was present in all but three cases and retinal changes present were consistent with all degrees of duration. In 19 cases with detachment the specimens were sufficiently well prepared and histories complete enough to determine the location and extent of the detachment. Of this group, nine were total, five inferior, three temporal, one nasal and one macular.

In the more long-standing and diffuse cases frequent findings included corneal degeneration, cataract, intraocular hemorrhage, uveitis, and evidence of secondary glaucoma.

Clinicopathologic correlation

The importance of correlating microscopic features with clinical findings is obvious, since this may lead to more precise criteria for clinical diagnosis.

The location of the thickest portion of the tumor in the posterior pole in proximity to the optic nervehead corresponds well with what is seen on ophthalmoscopic examination. The clinical appearance of a dome or lens-shaped mass is supported microscopically, although a portion of the elevation is doubtless lost due to evacuation of blood during enucleation. There is a definite tendency for

Fig. 4 (Jones and Cleasby). (Path. No. 5397.) This extensive choroidal hemangioma demonstrates variation in size of vascular spaces, deposition of bone within the lesion and adhesion of the retina to the tumor.

the more diffuse lesions to be associated with facial angioma and with earlier and more severe secondary changes. Of the seven eyes in this series, containing hemangiomas involving the entire choroid, four were present in patients with associated facial angioma. There were three additional patients with nevus flammeus in which the choroidal hemangiomas were large, but did not occupy the entire choroid.

The presence of an epichoroidal membrane is doubtless responsible in many cases for the yellowish or grayish appearance of the lesion. It seems likely that the foci of calcification or ossification are represented clinically by the light spots often present over the tumor. Since the growth is composed of dilated vascular channels it is not surprising that there should occasionally be a pinkish tint when viewed with focal illumination, although this is doubtless masked in the presence of an epichoroidal layer or thickened Bruch's membrane. The disorganization and proliferation of retinal pigment epithelium undoubtedly account for the gray or black patches frequently seen over the tumor and sometimes are suggestive of an inflammatory process. The choroidal pigmentary proliferation would cause a more uniform brownish coloration more likely to lead to confusion with melanoma of the choroid.

The appearance of a "moth-eaten" or cystic retinal pattern on ophthalmoscopic examination corresponds with the almost invariable incidence of edema and cystic degeneration seen microscopically. The susceptibility of the macular area to this kind of change is related to the looseness and thickness of Henle's fiber layer.

A choroidal hemangioma is composed of relatively mature and orderly tissue, accounting for its usually slow growth in comparison with other intraocular tumors.

The frequent location in and about the macular area accounts for the progressively

Fig. 5 (Jones and Cleasby). (Path. No. 7825.) This large hemangioma shows extension on both sides of the optic nerve. Also shown are a thick epichoroidal membrane containing fibrous tissue and proliferated retinal pigment epithelium. There is cystic degeneration of the adherent retina and marked proliferation of choroidal pigment within the tumor.

increasing hypermetropia and decreasing visual acuity seen during the growth of the tumor.

The infrequency of fundus changes suggestive of an inflammatory process is supported histologically by the lack of inflammatory changes in the tumor and adjacent tissues. Occasionally there is evidence of chronic uveitis, but this is usually in far-advanced cases in which other severe secondary changes have also taken place.

The frequent presence of secondary glaucoma clinically is supported by pathologic evidence, such as peripheral anterior synechias, iris atrophy and excavation of the optic nervehead. The mechanism of glaucoma production prior to onset of these late changes, especially frequent in the Sturge-Weber syndrome, is at present unexplained. The production of plasmoid aqueous[25] and hypersecretion of aqueous[5] have been advanced as explanations. Recently tonography has shown that in some cases a decrease of outflow is involved.[4] Angiomatous involvement of the filtration angle was not seen microscopically in any of our cases.

Diagnostic procedures

In addition to recognition of clinical characteristics and behavior, there are a number of diagnostic procedures which can be employed. Not all of these procedures are of proven value nor would they be appropriate in every case, but they have been collected in the hope that their merit may be determined in future studies.

1. *X rays.* Bone-free X-ray examination with the eye rotated in various positions could reveal the presence of calcium or bone in those cases where it has developed. This

Fig. 6 (Jones and Cleasby). (Path. No. 7033.) This high-power view shows ossification within the epichoroidal membrane and marked pigmentary proliferation within the superficial portion of the underlying tumor.

information would be of increased value in situations where secondary changes have resulted in inability to visualize the fundus. Intraocular ossification could occur in a purely inflammatory lesion, but is very unlikely to occur with malignant melanoma.[7,18,27] Intracranial calcification may be seen with the meningeal hemangioma of the Sturge-Weber syndrome.[52]

2. *Transillumination.* Transillumination studies of fundus lesions in general are often less than completely satisfactory. In the cases of this series in which it was tried, normal transmission of light was noted, indicating lesser density in comparison with other solid fundus lesions. Retroillumination[39] has been mentioned previously and is helpful in detecting the pattern of cystic retinal change and the lesser density of the tumor.

3. *Jugular compression.* This technique as described by Stokes[44] consists of placing a blood pressure cuff around the neck and inflating it to a level of 60 mm. Hg. The resulting compression of the jugular vein causes an elevation of the intraocular pressure in the involved eye. It could conceivably also cause an observable plethora of the tumor at the same time.

4. *Ocular compression.* Observation of a blanching of the lesion while pressure is applied to the eye would tend to confirm its vascular nature. This observation might be more apparent following jugular compression. No apparent changes would be likely if the lesion were covered by a thick epichoroidal membrane.

5. *Appearance under ultraviolet illumination after intravenous injection of fluorescein.* A technique of potential value is the injection of fluorescing substances intravenously with simultaneous observation by ultraviolet light. This test has been performed by Maumenee,[30a] injecting 10 cc. of five-percent fluorescein while observing the lesion with a Schepens binocular indirect oph-

thalmoscope in which a cobalt blue filter has been placed before the light source. Using this technique, the retinal vessels become fluorescent within 15 to 30 seconds. The vessels in the posterior fundus lose their fluorescence within two or three minutes, but the peripheral vessels fluoresce for about 10 minutes. Hemangiomas of the choroid light up beautifully, but possibly melanomas may also to some degree. Too few lesions have been examined to establish the value of the test.

6. *Radioactive phosphorus uptake.* P^{32}-uptake studies might be helpful if the lesion were located far enough anteriorly to allow access to the counting tube. There is a high percentage of positive uptake in cases of anteriorly located malignant melanomas of the choroid.[6, 12, 16, 45, 46] The test has less significance for lesions located posterior to the equator due to inability to place the counter over the tumor. It is likely that this test will be more valuable in differential diagnosis when a reliable counter is available for use with posterior lesions.[47] It is possible that the amount of blood present in a hemangioma might give rise to an increased response to the one-hour count, but it seems unlikely that the 24-hour count would be influenced in the absence of very young cells as opposed to those present in rapidly growing neoplasms. In one case in which P^{32}- studies were conducted on a choroidal hemangioma, the results were negative both preoperatively and on the enucleated specimen.[35]

7. *Angiographic studies with radiopaque material.*[5] This technique has been successful with vascular lesions elsewhere in the body, but to the best of our knowledge has not been utilized for study of choroidal hemangiomas.

8. *Changes during menstruation and pregnancy.* Berliner and Breinin[5] mention that it might be possible to observe alteration of the lesion during menstruation and pregnancy. We are not acquainted with any cases in which this has been of value.

9. *Biopsy.* Biopsy of a choroidal hemangioma was performed in a case recorded by Schepens and Schwartz.[42] They referred to one other report of this procedure[8] and suggested that it be considered if much doubt exists regarding diagnosis, especially if the patient refuses enucleation. Efforts to establish microscopic diagnosis of choroidal tumors by means of biopsy have generally been found to be dangerous and not sufficiently reliable to justify the risk.[17]

Treatment

In general there has been no specific treatment for hemangiomas of the choroid other than enucleation when secondary changes have resulted in blindness and pain. There have been occasional reports of attempts to destroy the tumor by diathermy, usually with discouraging results.[23, 26, 36] Dufour[14] feels it may be worthwhile in selected cases. Schepens and Schwartz[42] reported improvement in their case following treatment with perforating diathermy under constant ophthalmoscopic guidance. It seems likely that localized hemangiomas could be successfully treated by this technique, as has been recorded in instances of Von Hipple's retinal angiomatosis.[28, 48]

Surgical excision of the tumor was reported by Carreras Matas, who thought the lesion was a cysticercus, but this technique is fraught with great danger to the eye and cannot be recommended.

Various forms of radiation might have some effect on early cases, but is of unproven value. In view of the mature nature of the tissues involved and the known hazards of radiation, it is not recommended.

In children with facial angioma who develop glaucoma in the eye on the involved side, goniotomy can have at least temporary value in controlling the intraocular pressure.[3, 4]

Destruction of the tumor by means of the light coagulation technique devised by Meyer-Schwickerath holds great promise and

may well prove to be the treatment of choice in lesions which are sufficiently localized.[22, 31, 32]

Summary

This analysis of 28 cases of hemangioma of the choroid in which the diagnosis has been proved microscopically has been made in an effort to delineate and correlate features of clinical and histologic significance. Appreciation of the distinctive characteristics of this tumor might well lead to greater accuracy in diagnosis and avoidance of unnecessary surgery and enucleations.

Small hemangiomas may be entirely silent and unrecognized until the eyes are examined microscopically for some other reason. Hemangiomas which are large enough to cause symptoms leading to clinical examination are extremely difficult to diagnose because of their tendency to resemble a variety of other intraocular lesions. The one from which a differential diagnosis must be made most urgently is malignant melanoma of the choroid. Lesions large enough to cause symptoms are frequently associated with hemangiomatous lesions outside the eye, so that the diagnosis becomes more certain. These latter lesions have a tendency to be more diffuse and often lead to a sequence of complications resulting in loss of the eye.

A typical hemangioma of the choroid occurs in a young adult with a history of slowly progressive hyperopia and decreasing visual acuity in the involved eye. There may occasionally be isolated cutaneous angiomas on the face or body, although in the usual the Sturge-Weber syndrome ocular changes occur in infancy or childhood, progress more rapidly and are of a more severe nature.

Fundus examination reveals an elevated mass adjacent to the disc, usually on the temporal side, and often with an associated inferior retinal detachment. The tumor is moderately elevated, pale yellowish or gray in color and may have discrete patches of both light and dark color over the surface and at the margins. The overlying and adjacent retina shows cystoid changes and edema. The associated retinal detachment is devoid of holes or breaks and the subretinal fluid shows a pronounced tendency to shift upward when the patient lies down. Occasionally large vessels may be seen in the retina or choroid close to the lesion or in the episclera over the anterior portion of the eye. The intraocular pressure may become elevated and visual field examination may show a sector-type defect.

Microscopic examination of a choroidal hemangioma usually shows the lesion located adjacent to the disc and extending forward for a variable distance in tapering fashion toward the ora serrata. Elevation is usually slight to moderate, but in extreme cases can be as thick as seven millimeters. The blood spaces are variable in size, with both cavernous and capillary types usually present, although the former predominate. Often a moderate amount of pigment proliferation is present, either of the choroidal pigment-bearing cells within the tumor or of the overlying retinal pigment epithelium.

In the majority of cases an epichoroidal layer or membrane is interposed between the tumor and the overlying retina. This structure varies from only a disorganization of the pigment epithelium and a thin strand of fibrous tissue to a thick layer containing bone and calcium. The overlying retina is frequently adherent to the epichoroidal membrane and almost always shows evidence of edema and cystic degeneration. In addition, retinal detachment of varying extent is usually present.

Often large transcleral and episcleral vessels are present over the thickest portion of the lesion, suggesting a close relationship to the short posterior ciliary vessels. Study of eyes removed prior to onset of late secondary changes, such as cataract, hemorrhage, uveitis and synechias, reveals no anatomic explanation for the presence of elevated intraocular pressure.

Aside from recognition of characteristic appearance and behavior, there are a num-

ber of diagnostic procedures available for clinical study of hemangioma of the choroid. Not all of these procedures are of proven value nor would they be appropriate in every case, but they have been collected in an effort to stimulate study of their application.

Treatment in the past has been generally unsatisfactory, but there is reason to hope that early lesions may be successfully destroyed by carefully applied diathermy under ophthalmoscopic guidance and by light coagulation.

Case summaries

Case 1 (Path. No. 882)

A Negro who had had pain and progressive loss of vision in his right eye since a "chicken scratch" at the age of five years. The fundus was never seen. He had apparently had glaucoma but at the time of examination the pressure was only 30 mm. Hg (Schiøtz). His vision at the time of examination was nil. There were no skin lesions and there was no evidence of intracranial disease. The eye was enucleated at the age of 17 years. The microscopic examination showed a lesion at the posterior pole involving the full thickness of the choroid and consisting of cavernous blood spaces. An epichoroidal membrane contained fibrous tissue together with calcification and ossification. In addition there was an old organized detachment. There was some evidence of a penetrating injury with its sequelae. Tortuous transcleral vessels were present near the disc.

Case 2 (Path. No. 1067)

A white woman, who since the age of 36 years had had blurred vision in the left eye. Clinical examination showed a total detachment, bullous below, with an elevated three disc-diameter mass in the macular area. This was demarcated by a rim of pigment and there was some pigment migration over the apex of the lesion. Transillumination was negative. The intraocular pressure was normal. The visual acuity was hand movements. There were no skin lesions or intracranial disease and family history was noncontributory. The eye was removed with a diagnosis of intraocular neoplasm six years after the onset of symptoms. The enucleated globe showed an elevated macular lesion extending to the disc and composed of capillary and cavernous spaces. An epichoroidal membrane with fibrosis and proliferation of pigment epithelium was present. The retina showed extensive cystic degeneration.

Case 3 (Path. No. 1138)

A white woman, who since childhood had had a left hypotropia. There was a gradual onset of cataract and secondary glaucoma in the left eye. She had been seen early in the course of her disease by an examiner who felt she had a hemangioma of the choroid. At the time she was seen here the fundus view was blocked by a dense cataract. Glaucoma was present. Her vision was nil. Radiotherapy was instituted but without improvement and the patient had an enucleation at the age of 26 years. The pathologic examination showed a capillary and cavernous choroidal hemangioma two mm. in thickness and surrounding the disc with fibrosis and ossification in the epichoroidal membrane. The retina showed a choroidal pigment proliferation within the lesion and transcleral blood vessels were present.

Case 4 (Path. No. 2821)

A white man who at the age of 42 years had had an onset of sudden clouding of central vision in the right eye. His fundus showed a circular, partially pigmented, grayish, slightly elevated 1.5 disc-diameter lesion between the fovea and the disc. The retina was pulled up in folds over the fovea with a slight adjacent detachment. The vitreous was clear. Intraocular pressure was normal. The eye was enucleated with a diagnosis of choroidal tumor shortly after the onset of his symptoms. Pathologic study of the globe showed a choroidal hemangioma surrounding the disc with engorgement of the choroidal vessels. There was organized fibrous tissue over the lesion with old and fresh hemorrhage and proliferation of the pigment epithelium of the retina. There was a small retinal detachment adjacent to the tumor and a small focus of ossification of choroid temporal to the lesion.

Case 5 (Path. No. 3012)

A white man who had symptoms of "infection" in both eyes at the age of two years and whose right eye was enucleated at the age of 19 years. The intraocular pressure was raised, the eye was buphthalmic, and the fundus could not be seen. The left eye was phthisical. The patient had no vision in either eye. There was no history of skin lesions and the family history was not known. Pathologic examination of the globe showed a hemangioma of the choroid at the posterior pole around the disc with engorgement of adjacent choroidal vessels. Although there was no epichoroidal membrane, the retina showed cystic changes and there was calcification and ossification on the nervehead. Marked choroidal pigment proliferation was present within the lesion and dilated transcleral blood vessels were present.

Case 6 (Path. No. 3409)

A white man whose first symptoms occurred at the age of 65 years and whose eye was removed shortly thereafter. Following a cataract extraction, the eye had continued to be irritable and painful. The pressure was elevated and the fundus could not be seen because of bullous corneal edema. Vision was nil. Pathologic examination showed a hemangioma of the choroid at the posterior pole around

the disc. There was no epichoroidal membrane. The retina was adherent to the hemangioma and showed cystic macular degeneration. There was choroidal pigment proliferation within the lesion and dilated transcleral blood vessels were present.

CASE 7 (Path. No. 3753)

A white man who began to have painless loss of vision in the right eye at the age of 46 years and whose eye was enucleated at the age of 49 years. Fundus findings were not available but the provisional diagnosis was malignant melanoma of the choroid. Skull and chest films were negative. Examination of the globe showed a cavernous hemangioma of the choroid in the posterior pole. The overlying retina showed cystic changes. There was a diffuse increase in choroidal pigment as well as a benign melanoma associated with a posterior ciliary nerve. Dilated vessels were present near the tumor outside the sclera.

CASE 8 (Path. No. 4583)

A white man who had had gradual loss of vision in the left eye for four years prior to enucleation at the age of 47 years. The fundus showed a five diopter elevation temporal to the disc extending a third of the distance to the periphery. Definite features could not be made out. The pressure was not elevated and the retina did not appear to be detached. The diagnosis was a chronic inflammatory process with a possibility of malignant melanoma of the choroid. Vision was nil. Pathologic examination showed a circumscribed cavernous hemangioma of the choroid in the posterior pole about 1.5-mm. thick with a thin epichoroidal layer of fibrosis and choroidal pigment proliferation at the margins of the tumor. The retina was adherent to the lesion and showed cystic degeneration with a small adjacent detachment. Many drusen were present.

CASE 9 (Path. No. 5367)

A white woman who had "inflammation" and loss of vision in the right eye in infancy. The eye became unsightly and was finally enucleated at the age of 50 years. The pressure was elevated and a vascularized corneal leukoma blocked view of the interior of the eye. It was felt that a choroidal hemangioma might be present because of a congenital hemangioma involving the orbit and forehead on the same side. Microscopic examination showed a massive cavernous hemangioma of the choroid in the posterior pole surrounded by extensive fibrosis, ossification, and pigmentary proliferation. The retina was totally detached and the cornea was scarred. The lens could not be found in the specimen. Transcleral blood vessels were present over the lesion.

CASE 10 (Path. No. 5399)

A white woman whose symptoms began in infancy and whose right eye was removed at the age of 20 years. The cornea had been cloudy and the pressure elevated from early life. The eye became blind, unsightly and painful. Examination showed conjunctival congestion, enlarged cornea, updrawn pupil toward the site of a trephination, and an opaque lens. A nevus flammeus was present over the entire right face and a cavernous type hemangioma was present over the sacrum. She had had convulsive seizures since infancy but there was no record of X-ray films of the skull. Following enucleation, the posterior pole of the globe was found to contain a cavernous hemangioma with extensive ossification within the central portion of the lesion. Along the surface laterally some drusen were present. There was complete detachment and degeneration of the retina, degeneration and vascularization of the iris, and anterior synechias on each side. The lens was calcified. There was total detachment with cystic degeneration and disorganized architecture. In addition there were inflammatory signs in the anterior portion of the globe. Retinal pigment proliferation and excrescences of Bruch's membrane were present. The retina was adherent to the tumor and transcleral dilated vessels were seen over the lesion.

CASE 11 (Path. No. 5610)

A white women whose right eye was enucleated at the age of 36 years following gradual loss of vision for four years. Initial examination showed a solid whitish elevation above the disc with surrounding pigmentary change. There was a honeycombed appearance on retroillumination. The retina was detached below and there were dustlike vitreous opacities. The clinical diagnosis was chorioretinitis. Four years later the retina was totally detached with many new vessels over the surface and the iris showed extensive vascularization. Because the eye was blind and there was a possibility of intraocular malignancy, the eye was enucleated. Examination of the globe showed large vascular spaces of the choroid on the temporal side of the disc. The epichoroidal membrane was a fibrous plaque with proliferated pigment epithelium and fragments of adherent retina. The retina was totally detached with gliosis and cystic changes. There was also a fibrovascular membrane on the iris with ectropion uveae.

CASE 12 (Path. No. 5822)

A white woman whose left eye was enucleated at the age of 47 years. Her history was one of decreasing vision for six years. The fundus picture showed a highly elevated retinal detachment with an underlying pigmented tumor in the macular area. An X-ray survey was negative. The clinical diagnosis was malignant melanoma of the choroid. Examination of the enucleated eye showed a hemangioma of the choroid in the macular area with some extension around to the nasal side of the disc. The epichoroidal membrane showed fibrous tissue over the tumor with a thickened, irregular Bruch's membrane and large drusen. There was some derangement of the pigment epithelium and cystic retinal degeneration. The retina was adherent to the epichoroidal membrane and detached temporally.

CASE 13 (Path. No. 5823)

A white woman whose symptoms of declining vision and increasing pain began at birth and whose right eye was enucleated 24 years later. The fundus was not seen. The examination showed the right eye to be larger than the left with dilated episcleral vessels, a greenish iris, and elevated intraocular pressure. A congenital hemangioma was present on the right side of the face but skull X-ray films were negative and there was no history of convulsions. The eye was enucleated and the entire posterior pole showed a cavernous hemangioma of the choroid. There was extensive fibrosis, calcification and ossification of the epichoroidal membrane. Large drusen were also present. The retina was totally detached and disorganized with ossification and cholesterin deposits in the subretinal space. The cornea was large, there were peripheral anterior synechias and the lens was calcified.

CASE 14 (Path. No. 6938)

A white woman whose symptoms began in the right eye in childhood and whose eye was obtained following death at the age of 68 years. She had had poor vision since being struck in the eye at the age of four years. She complained of intermittent blurring and a sensation of pressure for five years prior to death. The fundus examination showed a globular mass above and nasal to the disc, measuring about one disc diameter in size, elevated 1.5 diopters, and surrounded by retinal degeneration. Slight subretinal pigmentation was present over the center of the mass. There were vitreous opacities. Transillumination was questionable The diagnosis was not made and the eye was obtained at autopsy. Examination of the globe showed a circumscribed capillary and cavernous hemangioma of the choroid in the involved area with pigmentary proliferation over the lesion. The globe was disorganized and only a small portion was processed.

CASE 15 (Path. No. 7033)

A white man whose left eye was removed at the age of 37 years. The history does not show when the onset of symptoms occurred. He had been shot in the eye with a 22 rifle, following which the eye became proptosed and exotropic. Examination showed a degenerated globe with dense cataract and posterior synechias. The enucleated eye showed dilated vascular channels of the choroid in the macular area with an epichoroidal membrane containing fibrous tissue, pigment proliferation, calcification and ossification. The retina showed gliosis and cystic degeneration over the tumor with a detachment nasally.

CASE 16 (Path. No. 7099)

A white woman whose left eye was removed at the age of 42 years. She had had an intermittent decline in vision for three years prior to first examination at the age of 39 years. There was a grayish subretinal mass above the disc with numerous whitish specks on the surface. At a later date the mass became larger and darker with hard white deposits around the lesion temporally and retinal striae above and below. Still later, a "honeycomb" appearance was noted, the vessels over the lesion became sausagelike, and a dependent detachment developed. The lack of pigment proliferation was thought to have ruled out inflammation. The diagnosis considered were malignant melanoma of the choroid, hemangioma of the choroid, and metastatic carcinoma. The eye was enucleated and found to contain a cavernous hemangioma of the choroid above the disc. The epichoroidal membrane consisted of pigmentary proliferation and drusen. The retina was detached inferiorly and showed cystic degeneration over the tumor.

CASE 17 (Path. No. 279R)

The history is not available. Examination of the globe showed the entire choroid involved in a cavernous hemangioma with proliferated pigment epithelium over the tumor. There was a total detachment of the retina and an intercalary staphyloma was present. Transcleral blood vessels were present over the tumor.

CASE 18 (Path. No. 2992R)

This was a newborn baby with buphthalmos and corneal ulceration. The eye showed a diffuse cavernous hemangioma of the entire uveal tract. The specimen was poorly processed, but slight proliferation of the retinal pigment epithelium and transcleral blood vessels could be seen.

CASE 19 (Path. No. 4279R)

This patient's right eye was enucleated at the age of 53 years. Symptoms of gradually declining vision had begun four years previously and six weeks prior to enucleation the patient noted a blind spot. Fundus examination showed an edematous pinkish area in the macular region crisscrossed with black streaks and merging at its edges with a normal fundus. The diagnosis was malignant melanoma of the choroid. Examination of the enucleated eye showed a cavernous hemangioma of the choroid at the temporal edge of the macula. There was moderate disorganization of the overlying pigment epithelium with considerable choroidal pigment in the anterior portion of the lesion. The retina showed a flat detachment with cystic degeneration.

CASE 20 (Path. No. 4591R)

History not obtained. Examination of the globe showed a small cavernous hemangioma of the choroid in the posterior pole. Transcleral blood vessels could be seen, but other details could not be made out due to poor processing of the specimen.

CASE 21 (Path. No. 5034R)

This was a three-year-old child with a Sturge-Weber syndrome. There was a diffuse hemangioma of the choroid, total retinal detachment with cystic degeneration and evidence of an attempted filtering operation. Choroidal pigment proliferation was present within the lesion.

CASE 22 (Path. No. 5916R)

A white man whose symptoms began with loss of vision in left eye three years prior to enucleation at the age of 10 years. The examination showed clear media with the disc almost completely covered by detached retina involving the temporal half of the fundus. This was dark gray in color and without visible holes. There were many refractile deposits on the retina and the arterioles over the detachment appeared constricted. Glaucoma was not present. X-ray films of the skull and chest were negative. The clinical diagnosis was malignant melanoma of the choroid. Study of the enucleated eye showed the entire choroid occupied by a thick cavernous hemangioma. The epichoroidal membrane consisted of a thick fibrous plaque and heavy pigment proliferation over the thickest part of the tumor. There was a total detachment of the retina with adherence to the epichoroidal plaque. This portion showed gliosis and cystic degeneration.

CASE 23 (Path. No. 6697R)

A Negro whose symptoms began in infancy and whose left eye was removed at the age of 27 years. The eye was blind as long as the patient could remember and had recently been painful. The intraocular pressure was elevated. The fundus could not be seen. External examination showed an enlarged eye with a corneal pannus. There was a "port-wine" hemangioma on the left side of the face and the left hard palate which had been present since birth. Although there was no history of convulsions, skull X-ray films showed increased vascular shadows in the left parietal region and indistinct calcification in the midline at the vertex. Microscopic examination showed the entire choroid thickened with a cavernous hemangioma. A thin epichoroidal membrane containing fibrous tissue and some areas of retinal pigment proliferation was present over most of the lesion. Areas of calcification and ossification were present. The retina was adherent to the epichoroidal membrane and showed extensive cystic degeneration. There was an episcleral hemangioma at the limbus. Corneal pannus and band keratopathy were present, the angles were closed by synechias and there was a fibrovascular membrane on the surface of the iris.

CASE 24 (Path. No. 6941R)

A white woman whose symptoms began in childhood and whose left eye was removed at the age of 42 years. The eye had been blind, painful and glaucomatous since early childhood. There was a "port-wine" hemangioma on the left side of the face since birth. Skull X-ray films were negative. The examination of the enucleated globe showed a flat capillary and cavernous hemangioma filling the entire choroid on one side with a few large choroidal vessels on the other side of the optic nerve. The overlying retina showed cystic degeneration over the major portion of the tumor. Cupping and atrophy of the optic nerve and a fetal type filtration angle were additional findings. There were dilated transcleral vessels over the lesion.

CASE 25 (Path. No. 49-178)

A white man whose symptoms of waviness and blurring of vision began at the age of 40 years and whose right eye was enucleated shortly thereafter. Examination of the fundus showed a solid retinal detachment at the inferior nasal edge of the disc about four disc diameters in extent with eight diopters of elevation. Grayish spots were present in the mass and the overlying retina showed cystic degeneration. A pie-shaped sector field defect could be mapped out. Intraocular pressure was normal. The clinical diagnosis was malignant melanoma of the choroid, although hemangioma was considered. The enucleated eye showed a cavernous choroidal hemangioma adjacent to the disc. The pigment epithelium over the lesion was largely destroyed and new-formed fibrous tissue was present between the tumor and the retina. The retina was detached over the tumor and showed cystic degeneration in all layers. Dilated episcleral vessels were present over the lesion.

CASE 26 (Path. No. 51-269)

A white woman whose right eye was enucleated at the age of 41 years one year after onset of flickering and blurring vision. She had had progressive hyperopia for several years. At the time of first examination by an ophthalmologist, refraction showed an error of $\pm$6.0D.sph. in the involved eye and plano in the other. Fundus examination showed an inferior retinal detachment with a bulla in the macular region. The retina in this area showed cystic degeneration and yellowish subretinal patches. The subretinal fluid could be seen to rise when the patient was lying down and to fall when the patient was erect. The patient was subjected to a diathermy operation, following which a cauliflower-shaped subretinal mass could be seen in the macular area. The diagnosis of malignant melanoma of the choroid was made and the eye enucleated. There were no associated skin lesions or intracranial disease. Pathologic examination revealed a cavernous choroidal hemangioma in the macular area with fibrosis and disorganization of the pigment epithelium over the mass. There was edema and cystic degeneration of the retina.

CASE 27 (Path. No. 54-77)

A white woman whose left eye was enucleated at the age of 34 years. Poor vision had been present for many years but during the six months immediately preceding enucleation, the loss had been pronounced. Four years previously vision was correctible to 20/60 with a +2.5D.sph. The other eye was 20/20 without correction. Fundus examination showed a bullous inferior retinal detachment with a mass in the macula elevated three to four diopters and measuring four disc diameters in diameter. This had a pinkish tinge with feeding vessels at the inferior edge. Glaucoma was not present. The clinical diagnosis was malignant melanoma of the choroid. There were no associated skin lesions or intracranial disease. Examination of the enucleated eye showed a cavernous hemangioma of the cho-

roid adjacent to the disc temporally with marked proliferation of choroidal pigment at its borders. The epichoroidal membrane was thin and fibrous. The retina was adherent to this membrane over the lesion and showed marked cystic degeneration. The retina was detached inferiorly. Numerous large transcleral vessels could be seen feeding into the tumor.

CASE 28 (Path. No. 57-83)

A white woman whose symptoms began at birth and whose blind, painful, glaucomatous right eye was enucleated at the age of nine years. The fundus could not be seen at the time of enucleation because of corneal degeneration and cataract, but five years previously a retinal detachment had been noted. There were large "port-wine" patches of the right face over the distribution of the first and second divisions of the trigeminal nerve. There was no evidence of intracranial disease. Examination of the enucleated globe revealed the posterior two thirds of the choroid to be occupied by a cavernous hemangioma. There was bone formation and calcification in the dense fibrous epichoroidal membrane with dispersion and disorganization of the pigment epithelium. The retina was totally detached and degenerated. There was evidence of recurrent intraocular hemorrhage and mild uveitis.

73 East 71st Street (21).

Clay and Webster Streets (15).

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OCULAR EFFECTS OF SYSTEMIC SIDEROSIS IN THE HUMAN*

JAMES R. DUKE, M.D.
Baltimore, Maryland

The pattern of the deposition of iron within the eye resulting from the prolonged retention of an intraocular ferrous foreign body—siderosis bulbi—is well known. Iron pigment tends to be deposited initially within the epithelial structures—the corneal endothelium, iris epithelium and dilator muscle, ciliary epithelium, retina, retinal pigment epithelium, and the subcapsular epithelium of the lens. As the process continues iron may also be found in the interlamellar spaces of the cornea, in the iris stroma and in the filtration angle. Eventually, the retina atro-

* From the Wilmer Ophthalmological Institute of The Johns Hopkins University and Hospital.

phies. Glaucoma may also be a complication. Following massive or repeated episodes of intraocular hemorrhage, a similar, though less marked, reaction may be produced by hemosiderin, with the deposition of iron pigment in the ciliary and iris epithelium and in the pigment epithelium of the retina.

Recently Cibis and his group* have studied the ocular histopathology of experimentally induced systemic siderosis in dogs. In animals subjected to repeated injections of saccharated iron oxide, granular iron deposits were found in the stroma of the uveal tract, within the endothelial cells of the choriocapillaris, and in the pigment epithelial cells of the retina and ciliary processes. These deposits were noted to persist for several months after the last injections. In the eyes of dogs killed six or seven years following cessation of repeated injections of saccharated iron oxide or of multiple blood transfusions striking changes in the retina were noted—loss of ganglion cells, gliosis of the retina, absence or migration of retinal pigment epithelium in some areas with proliferation and hypertrophy of this epithelium in other areas, and chorioretinal adhesions. The amount of stainable iron found in the tissues was small, being deposited principally in the pigment epithelial cells of the retina and ciliary body and in the endothelial cells of the choriocapillaris.

These authors also included the study of an eye obtained at autopsy from a patient who had received about 150 blood transfusions for severe aplastic anemia. Iron granules filled macrophages and endothelial cells of the capillaries in the retina and the choriocapillaris. Fine granular deposits of iron were noted in the epithelial cells of the ciliary processes and pars plana. Little iron was seen within the retinal pigment epithelium. The writers did not state the time interval during which the patient had received these transfusions.

* Cibis, P. A., Brown, E. B., and Hong, S.: Ocular effects of systemic siderosis. Am. J. Ophth., 44: 158-172 (Oct. Pt. II), 1957.

The publication of the paper by the Cibis group prompted me to study the eyes which had been obtained at autopsy from patients in whom the diagnosis of hemochromatosis or hemosiderosis appeared in the final autopsy report. The whole eye is not routinely removed at autopsy at The Johns Hopkins Hospital and the posterior segments of the eyes were available only in those patients in whom the cranial cavity had been opened at autopsy. Thus, the ciliary body and iris, sites of predilection for the deposition of hemosiderin, were not available for study. Nor was it possible to evaluate the incidence of occurrence of ocular involvement in systemic siderosis.

If one considers those cases with positive ocular findings they tend to fall into one or the other of two clinical groups—those with hemosiderosis secondary to repeated transfusions for a blood dyscrasia and those with hemosiderosis associated with cirrhosis of the liver.

In the first group, those with the deposition of hemosiderin secondary to repeated blood transfusions, eyes from 12 cases were available for study (table 1). The known durations of the blood dycrasias varied from 18 years to four months. Each of these patients with the exception of two, had had a large number of transfusions over a period of years or had had a relatively large number of transfusions in the terminal few months of life. The degree of systemic hemosiderosis was graded rather arbitrarily as minimal, moderate, or severe; and a similar system, employing plusses, was used to indicate the degree of deposition of hemosiderin within the eye. Table 1 indicates that there is little correlation between the degree of systemic hemosiderin deposition and that within the eye; nor is there any correlation between the number of transfusions and the degree of ocular hemosiderosis.

There were 10 other cases of systemic hemosiderosis secondary to blood transfusions, in which no changes in the eyes were found at all. One of these cases had had 100

TABLE 1

HEMOSIDERIN DEPOSITION ASSOCIATED WITH TRANSFUSION

Eye Pathology Number	Duration of Blood Dyscrasia	Transfusion Record	Systemic Hemosiderin Deposition	Ocular Hemosiderin Deposition		
				Sclera	Choroid	Other
13993	13 yr.	35/7 yr.	Severe	++	++	Retina++ Dura++
18321	10 yr.	"many"/10 yr.	Moderate	+++	++	
13477	10 yr.	18/2 yr.	Severe		++	
13655	1 yr.	100/6 mo.	Moderate		++	
6559	4 mo.	12/1 mo.	Moderate		++	
11709	13 yr.	31/18 mo.	Severe		+	
13996	3 yr.	21/18 mo.	Severe		+	
10990	1 yr.	27/5 mo.	Moderate		+	
10191	2 yr.	"many"/2 yr.	Severe			Retina+
11226	9 mo.	"many"/9 mo.	Severe		+	
11264	18 yr.	none/14 yr.*	Moderate		+	
14814	5 yr.	Probable; history lost	Moderate	+		

* Sickle-cell anemia with probable severe *in vivo* hemolysis during crisis.

TABLE 2

HEMOSIDERIN DEPOSITION ASSOCIATED WITH LIVER DISEASE

Eye Pathology Number	Duration of Primary Disease	Cirrhosis	Skin Changes	Systemic Hemosiderin Deposition	Ocular Hemosiderin Deposition		
					Sclera	Choroid	Other
3209	4 yr	Yes	Bronze	Severe	+++	+	
17637	2 yr.	Yes	Bronze	Severe		++	
11044	2 yr.	Yes	No	Moderate	+	+	
1771	7 mo.	No[1]	Jaundice	Moderate	++		
5330	5 mo.	Yes	Jaundice	Moderate	+	+	
6995	?	Yes	Jaundice	Moderate	++	++	
15976	?	Yes	No	Moderate	+		
14499	?	Yes	No	Moderate	+		
11312	?[2]	No	No	Minimal[3]		+	Dura+

[1] Liver involved in Hodgkin's disease.
[2] Autopsy disclosed chronic nephritis, duration unknown.
[3] Spleen only involved.

Fig. 1 (Duke). Deposition of hemosiderin granules in linear fashion within and between scleral fibers. (Gomori's iron stain, ×480.)

transfusions over a period of two years; another had had 60 transfusions over two and a half years. These two cases, each showing a marked degree of systemic siderosis indicate that numerous transfusions over a prolonged period do not inevitably lead to the deposition of hemosiderin within the eye.

In Table 2 are listed the nine cases of ocular hemosiderin deposition associated, with but one exception, with liver disease. In this excepted case (EP #11312) the patient, a new one to the hospital, died a few days after admission. Chronic nephritis was found at autopsy; the liver was normal. There was one clear-cut case (EP #3209) of idiopathic hemochromatosis with cirrhosis, diabetes, and a bronze discoloration of the skin. Again within this group there seemed to be no correlation between the degree of systemic hemosiderosis and that within the eye.

In two other cases of systemic hemosiderosis associated with cirrhosis and in seven other cases of systemic hemosiderosis associated with neither liver disease nor with a history of transfusions, no ocular changes were found.

Microscopic findings

The eyes were studied in sections stained with hematoxylin and eosin and in sections depigmented of melanin and then stained with Gomori's iron stain. The changes observed appeared to be the same whether the hemosiderin deposition was associated with liver disease or with blood transfusions.

An unexpected finding, and striking when present, was the presence of hemosiderin in the sclera. Here the hemosiderin appeared as tiny, round granules which initially tended to align themselves longitudinally, parallel to the scleral lamellae (fig. 1). These deposits were apparently both between the scleral fibers and within the fibers themselves. As the extent of the deposition increased, large masses of these granules aggregated so that the longitudinal alignment of the granules became less apparent. The depositions tended to be either in the mid zone of the sclera (fig. 2) or in the inner zone where they merged with depositions in the suprachoroidea (fig. 3). It was unusual to find the sclera diffusely involved. There

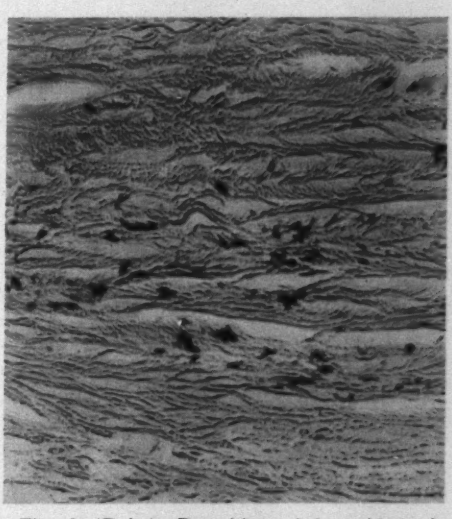

Fig. 2 (Duke). Deposition of hemosiderin in midzone of sclera. Note absence of reaction to pigment and preservation of normal scleral architecture. (Gomori's iron stain, ×120.)

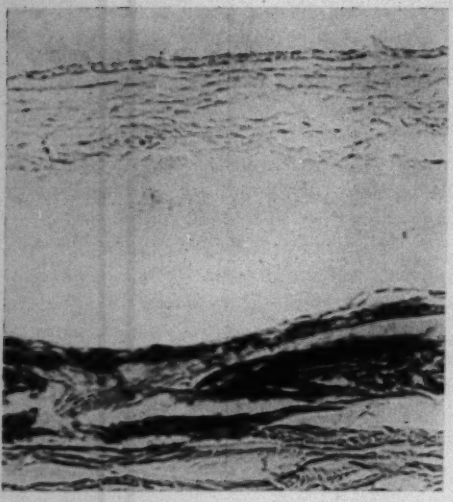

Fig. 3 (Duke). Deposition of hemosiderin in suprachoroidea and sclera. Note absence of involvement of depigmented pigment epithelium. (Gomori's iron stain, ×120.)

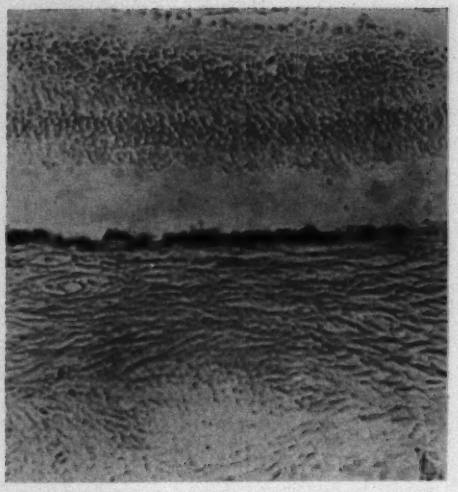

Fig. 5 (Duke). Heavy accumulation of hemosiderin in retinal pigment epithelium near margin of optic disc. (Gomori's iron strain, ×120.)

was no tendency for the deposits to aggregate about the sites of exit and entrance of vascular channels or ciliary nerves. The hemosiderin deposition was attended by no cellular inflammatory reaction nor was there any evidence of reactive fibrosis. In fact, the architecture of the scleral lamellae appeared undisturbed by the hemosiderin deposition. In two instances there were depositions of hemosiderin in the dura.

The extensive deposits of hemosiderin within the sclera were striking because this structure is not commonly involved in cases

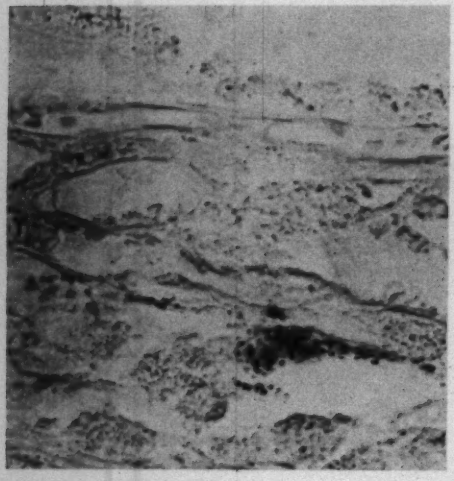

Fig. 4 (Duke). Hemosiderin granules within endothelial and stromal cells of the choroid. (Gomori's iron stain, ×480.)

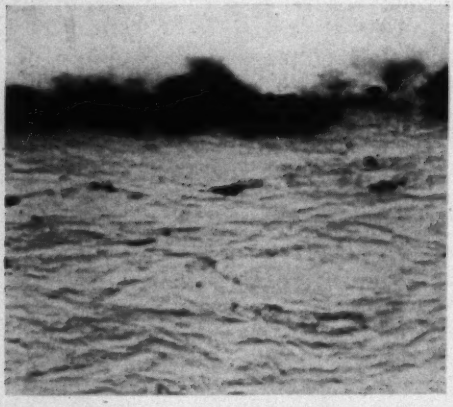

Fig. 6 (Duke). Detail of Figure 5 showing hemosiderin deposition within pigment epithelium and within the sclera at margin of optic disc. (Gomori's iron stain, ×480.)

of prolonged retained intraocular ferrous foreign bodies even when the condition has progressed to the stage of siderosis bulbi. Nor did Cibis and his group report comparable hemosiderin deposits in the sclera in their experimental animals.

In the choroid the deposition was seldom as striking as it was in the sclera. The hemosiderin was found most frequently in the form of small round granules aggregated in the stromal cells and in the chromatophores (fig. 4). Occasionally, macrophages within vascular channels were filled with hemosiderin, and rarely the material was deposited within the endothelial cells lining the blood vessels. Again the absence of inflammatory reaction or scarring was noteworthy.

In only two cases (EP #13993) and (EP #10191) was the pigment epithelium of the retina involved at all. In each instance a few of these cells at the margin of the optic disc contained the granules (figs. 5 and 6). Elsewhere in these two cases, the retinal pigment epithelium was free of hemosiderin and in none of the other cases examined was there any involvement of this structure. The remaining components of the retina were unaffected. No retinal changes which could be attributed to hemosiderin were noted. No obstructions of retinal capillaries similar to those in the one patient described by Cibis, et al., were noted, though in the present series of cases no patient received as many transfusions as did the patient reported by Cibis' group. It is interesting that in the case which showed the most marked ocular deposition of hemosiderin, the case of hemochromatosis (EP #3209) of four years' known duration, there were found none of the degenerative retinal changes comparable to those in Cibis' dogs, which were examined six or seven years after the cessation of repeated transfusion of blood or injections of saccharated iron oxide.

Summary

The eyes in 40 cases showing varying degrees of systemic hemosiderosis related either to numerous blood transfusions, to liver disease, or to other obscure factors, were studied for the presence of ocular hemosiderosis. In 21 of these cases there were deposits of hemosiderin within the eye. These deposits were located principally in the sclera and choroid. No changes secondary to these pigment deposits were observed. In two cases a small amount of hemosiderin was found in the pigment epithelium of the retina. No changes in the retina in any case which could be attributed either to the early or late effects of hemosiderin were recognized. There appeared to be no correlation between the degree or severity of systemic hemosiderosis and that of ocular involvement. Many of the cases of severe or widespread systemic hemosiderin deposition had only minimal deposits within the eye. It should be re-emphasized that these observations concerning the location and extensiveness of ocular hemosiderin deposition are based solely upon studies of the posterior ocular segments.

The Johns Hopkins Hospital (5).

MIOTIC IRIDOCYCLITIS: ITS ROLE IN THE SURGICAL TREATMENT OF GLAUCOMA*

SAMUEL V. ABRAHAM, M.D.
Los Angeles, California

While the treatment of glaucoma is faced with increased confidence of late years, especially in the case of the iris-block type and more particularly in the prophylactic care, there is still an attitude of hopelessness regarding simple glaucoma, as reflected in the words of Roper[1] who said, "Until we know more, no criteria for choice of surgery can be advanced." The prognosis for most chronic cases, especially for those of the wide-(open) angle type seems grave (Duke-Elder).[2] It has been said (Pillat,[3] Hill[4]) that the longer surgery is put off, the worse the prognosis. In darkly pigmented eyes, the results of surgery have been particularly disastrous (Rones,[5] Illif,[6] Shaffer[7]).

Any change in the treatment which may possibly improve our results should be welcomed. In this report the change advocated involves primarily the preoperative care. The material covered in this report is *not* extensive, covering only 75 eyes suffering with primary glaucoma. However, the data are so provocative that a preliminary report is being submitted for serious study and consideration.

This work is based on the fairly well-founded idea that on using miotics an increase in the capillary permeability of the vascular bed occurs (Sugar,[8] Seidel,[9] Colle, Duke-Elder and Duke-Elder,[10] Goldmann,[11] Scholz,[12] Leopold and Comroe,[13] and Hodgson[14]). The aqueous may show increased protein, increased pigment, as well as increased temperature. The posterior surface of the cornea and the anterior lens capsule may show fine pigment deposits. The sphincter region may show areas of atrophy alternating with cysts (Vogt[15]). Posterior synechias may be present at the sites of the cysts previously noted, especially after surgery (Vogt[15]).

In order to emphasize that these and other changes are produced by the use of miotics, I[16,17] use the term "miotic iridocyclitis." I feel the picture produced by prolonged use of miotics is very similar to that produced by chronic infection.

It is conceivable that there may be an unfavorable reaction to surgery if surgery is done in the face of "increased capillary bed, edematous tissue and vesicles or cysts." Operating on an "inflamed" eye invites the formation of such complications as adhesions, iris atrophy, annular synechias, and favors greater obstruction of the iris angle, if not more serious complications.

PRESENTATION OF DATA

To evaluate the influence of miotics on the results of glaucoma surgery, it seemed desirable to pick only those cases not showing obvious inflammatory signs before treatment. For this reason, this report covers only those cases of primary glaucoma which were not acute. Only those cases were chosen which had been under observation at least six months after the first surgery. All cases used are from my private surgical practice. This report covers the reaction noted at least two months after the first operation. All operations were done by me or with me participating. There were 15 cases operated upon by Dr. Robert K. Abraham assisted by me.

There was a total of 75 eyes which satisfied the basic requirements for this report. The cases were all cases of primary wide- and narrow-angle glaucoma without previ-

* From the Department of Ophthalmology, Mount Sinai Hospital and Clinic. Presented in part during lectures before the Los Angeles Society of Ophthalmology, October 4, 1956, and before the Association for Research in Ophthalmology, January 29, 1957.

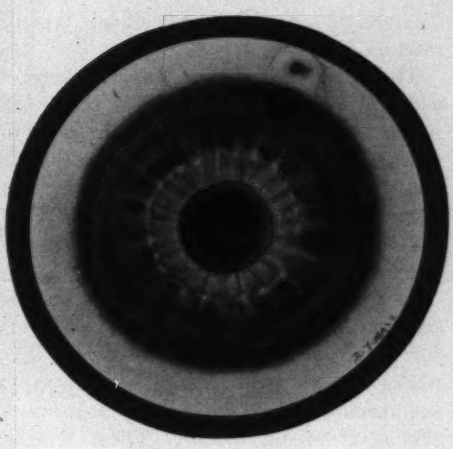

Fig. 1 (Abraham). Example of minimum (or zero) postoperative reactions.

ous surgery and were not in an acute stage. Fifty-seven of these patients had been using miotics for six or more months before the time of surgery. This time varied from six months to 20 years (one case) averaging slightly more than four years (4.27 years). The remaining 18 of these patients had been using miotics three months or less at the time of surgery. This time varied from four days to three months, averaging almost six weeks (5.8 weeks).

The postoperative reactions were studied in relation to the elimination of miotic therapy. In one group (A), miotics were eliminated 48 hours or less before surgery. In the second group (B), miotics were eliminated at least 72 hours before surgery. The postoperative reactions were determined and recorded as follows:

Zero (0), if practically no reactions were noted on slitlamp examination at least two months after surgery (fig. 1). In this group of cases, the pupils were freely reactive to light; there were no posterior synechias; the pillars were free; there were few, if any pigment deposits on the lens; there were no definite signs of lens changes from the preoperative state; and the peripheral anterior synechias were little, if at all, increased over the preoperative state, except in cases following iridencleisis where peripheral anterior synechias seem routine along the iris inclusions.

Plus one (+), if on slitlamp examination at least two months after surgery, reactions were noted to be present, but not to a marked degree (fig. 2). In this group, the pupil was reactive to light, but not along its entire margin, and perhaps a bit sluggishly; posterior synechias might be present (one or two); the pillars were free or partially adherent to lens; pigment was scattered on the lens capsule, but not in large clumps nor extensively; lens changes, if present, were minimal; peripheral anterior synechias were still only slightly increased, if at all, over the preoperative state; iris atrophy, if present was minimal.

Plus two (+ +), if on slitlamp examination at least two months after surgery, most of the following reactions were noted (at least four out of the first five) (fig. 3). Fixed or almost fixed pupil, complete or almost complete annular synechias; pillars adherent to lens; definite gross evidence of iris atrophy; extensive pigment in areas of adherence of iris to lens, with pigment on lens elsewhere; lens changes may be present,

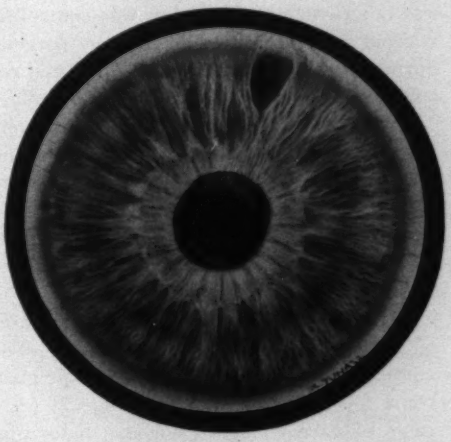

Fig. 2 (Abraham). Example of plus-one (+) or moderate postoperative reactions.

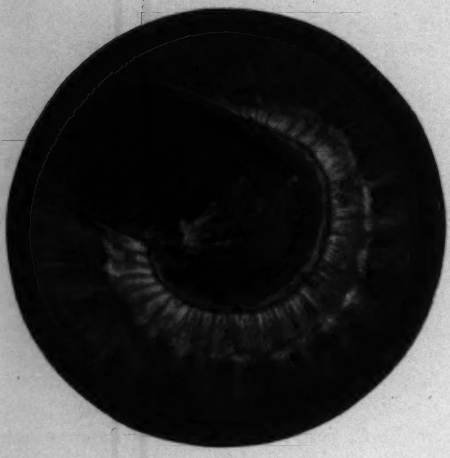

Fig. 3 (Abraham). Example of plus-two (++) or severe postoperative reactions.

especially in an area of posterior synechias; peripheral anterior synechias may be considerably increased.

In all cases listed, other complications following surgery are noted. Such complications as hemorrhage, hypotony, flat anterior chamber are particularly noted. These may be related to the further need for miotics or surgery. Further glaucoma surgery, if done, is noted unless such surgery was not indicated until after cataract surgery. Unless otherwise noted, tension was controlled without use of miotics or further surgery during the observation period. The listed results are limited to objective findings only.

In Figure 4-A are presented the graphs for all 75 cases covered by this report. The curves for all 75 cases (—) and the curve for all the 57 cases under more prolonged miotic therapy(---) are similar. Neither shows any sign of a preponderance of one type of reaction over another.

Figure 4-B shows the curves for all cases of narrow-angle glaucoma (39 cases). The curves for all 39 cases of narrow-angle glaucoma (—) and the curve for the 29 (---) cases of narrow-angle glaucoma under prolonged miotics are similar. These also show no signs of a preponderance of one type of reaction over another.

The same is true for the 36 cases of wide-angle glaucoma (fig. 4-C). Here, too, we find that the curves for all the cases of wide-angle glaucoma (—) and for the 28 cases of wide-angle glaucoma on miotics for six months or more (---) are similar. Here too, we find no sign of a preponderance of one type of reaction over another.

In Figure 4-A, the data covering only 18 cases under miotic therapy before surgery for three or less months (average 5.86 weeks(-·-·-)) suggest that there is possibly less reaction in general to these cases not on prolonged miotic therapy. These findings will be considered below under "Discussion."

In Figure 5 may be seen the reaction curves following surgery in the two groups of cases: Group A comprises those cases (—) in which the miotics were stopped before surgery, if at all, for less than 48 hours; Group B comprises those cases(---) in which the miotics were stopped for at least 72 hours before surgery.

In Figure 5-A are shown the curves for all 75 cases. In Figure 5-B may be seen the curves for the 57 cases under prolonged miotic therapy (at least six months, average 4.3 years). Figure 5-C shows the curves obtained from the 18 cases under miotic therapy not over three months (5.8 weeks). In

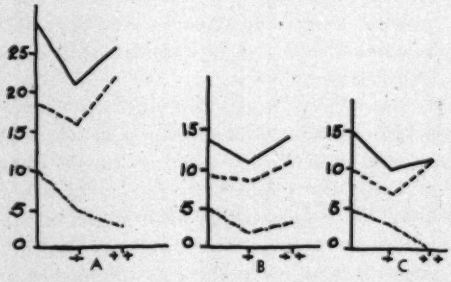

Fig. 4 (Abraham). Graphs of all cases, showing number of cases giving each type of reaction. (See text for explanation.)

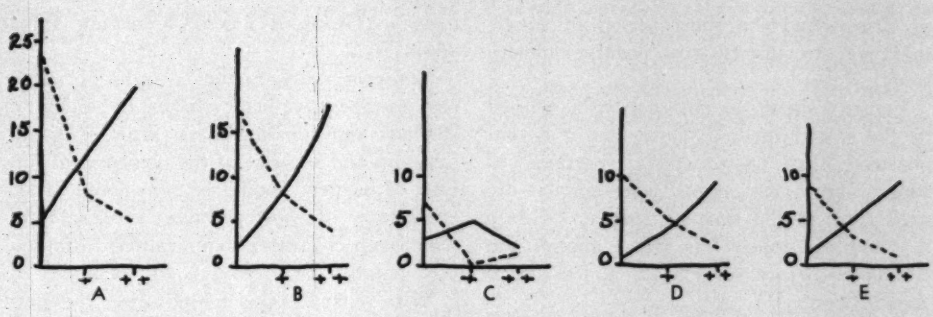

Fig. 5 (Abraham). (A) All cases. (B) All cases under miotic therapy for at least six months (average 4.27 years). (C) All cases under miotic therapy three months or less. (D) All cases of narrow-angle glaucoma under miotic therapy six months or more (average 6.16 years). (E) All cases of wide-angle glaucoma under miotic therapy for six months or more (average 2.3 years). (——— Miotics used to within 48 hours or less of surgery. - - - - Miotics omitted at least 72 hours before surgery.)

Figure 5-D are seen the curves for 29 cases of narrow-angle glaucoma under miotic therapy at least six months (average 6.16 years); and in Figure 5-E a similar group of 28 cases of wide-angle glaucoma (under miotic therapy an average of 2.3 years).

In Figure 5-A, B, D, and E, it may be noted that all curves are very similar. The cases in which miotics were eliminated for 72 hours or more definitely showed relatively little reaction to surgery, while the cases with miotics not eliminated at all or eliminated for 48 hours or less before surgery showed much greater reaction to surgery.

The fact that the period of miotic therapy was much longer in the narrow-angle glaucoma (6.16 years) than in the wide-angle glaucoma (2.3 years), did not seem to be a factor in the results.

The cases of Group A and Group B of the narrow-angle type were under miotic therapy about the same number of years (Group A, 5.9 years; Group B, 6.45 years).

The cases of Group A of the wide-angle type were under miotic therapy an average of only 1.3 years, while the similar cases of Group B were under miotic therapy an average of 3.15 years. Again, the duration of therapy does not seem to be so much of a factor in the postoperative picture.

The 18 cases under miotic therapy three or less months may be expected to show less postoperative reaction than the cases under more prolonged therapy. However, here too, a difference in reaction postoperatively is noted between Group A and B (fig. 5-C). One sees a definite suggestion that less postoperative reaction is present if the miotics are eliminated for at least three days before surgery. The probability exists that too few cases are included in this series

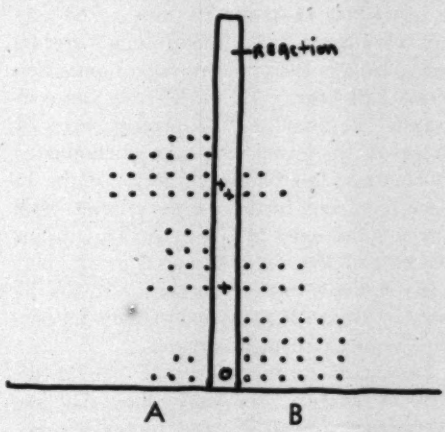

Fig. 6 (Abraham). Scatter graph of observations in all cases. (A) Using miotics to within 48 hours or less of surgery. (B) Not using miotics for at least 72 hours before surgery.

of cases (under a short period of miotic therapy), to justify any positive conclusions.

Figure 6 shows the observations as plotted by the scatter method. Here, too, it is emphasized that postoperative reactions to surgery are much greater when miotics are used close to the time of surgery (Group A) and are much less when miotics are eliminated before surgery for at least three days (Group B).

Figures 5 and 6 also show that minimal or zero reactions are rare in the Group A, in which miotics are used close to the time of surgery, while such minimal or zero reactions are quite frequent in Group B, in which miotics are eliminated for at least 72 hours before surgery.

Discussion

The data, as may be seen by a glance at the figures presented, definitely suggest a direct relation between elimination of miotics before surgery and decreased postoperative reactions as noted on slitlamp examination two or more months after surgery.

With regard to control of tension, it may be noted that 51 of the 75 cases, or 68 percent were controlled without miotics or further glaucoma therapy (average observation period 2.61 years). Of the 24 cases not controlled, 19 cases or 79.2 percent were of Group A, the group with miotics eliminated 48 hours or less before surgery. Of the 11 cases requiring further surgery, nine (81.8 percent) belonged to Group A. This means that nine of 38 cases of Group A or 23.7 percent required further surgery. Of the 37 cases of Group B, only two or only 5.4 percent required further surgery.

In regard to the factor of age at the time of surgery, the data show that the average age for all 75 cases was 60.9 years, varying from 37 to 77. The average age for the 38 cases in Group A was 59.3 varying from 37 to 77. The average age for the 37 cases in Group B was 63.4 varying from 45 to 76.

Naturally, such factors as type of surgery, postoperative hemorrhages, hypotony or shallow anterior chambers after surgery, duration and severity of the glaucoma at the time of surgery should be considered in an evaluation of postoperative results. One would expect greater complications to follow postoperative hemorrhages, for example.

With regard to this complication, the data show there were 27 cases with hemorrhage into the anterior chamber following surgery, while the patient was still in the hospital, or 36 percent of the 75 cases showed this complication. Twelve of the 27 eyes with hemorrhage required further therapy (or 44.4 percent). Twelve of the 48 cases without hemorrhages required further therapy (or 25.0 percent). Of the 16 eyes with hemorrhages belonging to Group A, 10 required further therapy. Only two of the 11 eyes with hemorrhages in Group B required further therapy.

It would seem that hemorrhages definitely lead to more serious complications. It would also seem that hemorrhages are more frequent in cases of Group A. Hemorrhages are not only less frequent in cases of Group B, but when they occur, are less serious—produce fewer complications. It would seem that the use or elimination of miotics before surgery may be one of several factors, such as the type of surgery, in the incidence of postoperative hemorrhages.

Whether or not the changes in therapy in the latter years may be a factor cannot be definitely determined at this time. It is true that more preoperative Diamox was used in recent years, especially as the miotics were discontinued before surgery.

Postoperative miotics were not used except on one occasion immediately after surgery only. Steroids were used more frequently, both locally and orally in the postoperative period. In any event, the reaction in those cases of Group A and those of

Group B could not be considered due to any difference in treatment with Diamox, steroids, and so forth, as both groups of cases were treated similarly.

In those 47 cases operated upon since March, 1957, there were 36 cases under miotic therapy for six or more months. Of these 36, there were 12 cases in Group A and 24 cases in Group B. There were only three cases of the 12 in Group A that showed minimal reactions postoperatively (25 percent), while in the 24 cases of Group B there were 14 cases with practically no postoperative reaction (58.3 percent). Of the 12 cases in Group A, five cases showed extensive postoperative reaction (42.5 percent), while in the 24 cases of Group B, there were only three with extensive postoperative reactions (only 12.5 percent).

Of the 11 cases under miotic therapy three months or less before surgery, eight belonged to Group B. Of these eight, seven gave minimal (zero) reactions, while of the three cases in Group A, only one gave minimal (zero) reactions. Findings in the cases cared for most recently compare with the findings in the cases cared for in the earlier period before 1957 in their similar responses to elimination of miotics before surgery. There were only five cases of the 28 cases operated upon before March, 1957, which belonged to Group B. This is explained as follows: Originally, it was thought that elimination of miotics only 24 to 48 hours before surgery would be sufficient. The results were suggestive of some benefit, but were not clearly obvious and a greater elimination period was decided upon.

The question of surgical technique is admittedly important in a final analysis of the problem. There is no doubt that rough, careless technique in an individual case can lead to trouble. It would be expected to affect both group of cases, and can, therefore, be dismissed here. The type of surgery, too, may be a factor in the postoperative reactions, such as hypotony and hemorrhage.

There were 65 cases involving scleral incisions. With these there were 21 sclerectomies with total iridectomies; three pure cyclodialyses; 22 iridencleises; four cases of cyclodialyses with peripheral iridectomies.

There were nine cases with sclerectomies and peripheral iridectomies in Group A. Of this number, four showed severe (++) postoperative reactions. Only two showed minimal (zero) reactions. Of the 12 cases with sclerectomies and peripheral iridectomies in Group B, there were no cases with severe postoperative reactions and 10 cases with minimal (zero) reactions.

Of the 15 cases of sclerectomies with total iridectomies, 11 were in Group A. Seven of these 11 showed severe postoperative reactions, and none showed minimal (zero) reactions. Of the four cases of Group B, none showed severe postoperative reactions and two showed minimal (zero) postoperative reactions.

Of the 12 cases of iridencleises in Group A, seven showed severe (++) reactions after surgery and only one case showed minimal (zero) reaction. Of the 10 cases of

TABLE 1

DIFFERENCES BETWEEN GROUP A AND GROUP B FOLLOWING SURGERY

	Group A (38 cases)*	Group B (37 cases)†
Tension controlled	19	32
Total	16	11
Hemorrhages Required postoperative treatment for glaucoma	10	2
Postoperative treatment (miotics and surgery)	19	5
Second surgery	9	2
++Postoperative reactions	20	5
Zero postoperative reactions	5	24

* Group A: Miotics stopped before surgery for 48 hours or less.

† Group B: Miotics stopped before surgery for at least 72 hours.

TABLE 2

SUMMARY OF 75 CASES OF CHRONIC NARROW-(IRIS-BLOCK) AND CHRONIC WIDE-(OPEN) ANGLE GLAUCOMA

Case No.	Age	Sex	Glaucoma		Type Surgery	Complications	Days to Surgery without Miotics	Reaction			Further Rx.	Period of Observation	Remarks
			Type	Years on Miotic Therapy				0	+	++			
1	53	Mw	N	12	Irid.	Hem.	1½			×	M. Su.	3	Paget's disease
2	52	Mw	N	7	C.		2			×		½	
3	64	Fw	N	2	S.T.I.		0			×	M	11	Cataract advanced rapidly
4	65	Fw	N	3	S.T.I.		0			×	M	12	Cataract advanced rapidly
5	54	Fw	N	13	C.P.I.	Hem.	2		×		M	2	
6	49	Fw	N	4	S.T.I.	Hem.	0			×	M. Su.	10	
7	77	Fw	N	2	S.P.I.	Sm. Hem.	2			×		1	
8	58	Mw	N	9	C.P.I.		2			×		½	
9	67	Fw	N	7	S.T.I.		0		×		M	4	
10	64	Fw	N	8	S.P.I.	Hem.	2			×	M	1	
11	54	Mw	N	2	S.T.I.C.	Hem.	0			×	M	10	Cataract advanced rapidly
12	60	Mw	N	2	S.T.I.	Hem.	½		×			1	Acute rise in tension 5 da. before surgery
13	70	Mw	N	2	P.I.		2	×				1	Lost other eye (absol. glau.)
14	64	Mw	N	7	Irid.	Sm. Hem.	2		×			1	
15	41	FN	N	3 mo.	S.T.I.		1½			×		3½	
16	69	Fw	N	1 mo.	S.T.I.		1		×			3½	
17	55	Mw	N	1 mo.	T.I.		2		×			1	
18	50	Fw	N	6 wk.	Irid.	Hypotony	0	×				1½	
19	50	Fw	N	6 wk.	C.P.I.		0	×			M	1½	
20	65	FN	N	5 da.	S. Irid.		1			×	M. Su.	2½	Absol. glau. in other eye
21	73	Mw	W	1/12	S. Irid.		1		×			2½	Devel. dendritic keratitis postop.
22	60	Fw	W	6 wk.	C.S.P.I.	Hem.	1		×		M	1½	
23	56	Fw	W	1 wk.	S.P.I.	Sh. C.	2	×				½	Advanced glau. no prev. Rx.
24	56	Fw	W	1 wk.	S.P.I.	Sh. C.	2		×			½	Early glau.
25	65	Mw	W	1	T.I.		1		×			6	EST
26	61	Fw	W	½	S.P.I.		1			×	M	12	Corneal dystrophy after cataract surgery
27	46	Fw	W	1	S.P.I.	Hem.	0			×	M	7½	
28	55	Fw	W	1	Irid.	Hem.	1			×	M. Su	3½	
29	38	MN	W	1	Irid.	Hem.	2		×			3	
30	61	Mw	W	¾	S.T.I.		1			×		5	
31	75	Fw	W	2	S.P.I.C.	Hem.	1¾	×				2	
32	49	Fw	W	2	S.T.I.		0			×	M. Su	9	
33	55	Fw	W	2	S.P.I.	Hem. Sh. C.	0		×		M	9	Cataract advanced rapidly
34	69	Mw	W	2	Irid.		1			×	M. Su.	2½	Cataract surgery later
35	69	Mw	W	2	Irid.		1			×	M. Su.	2½	Cataract surgery later
36	69	Fw	W	¼	Irid.	Hypot. Hem.	2			×		1	
37	65	Mw	W	1	S.T.I.	Sh. A. Ch. Sm. Hem.	8		×			1½	
38	58	Fw	W	1	Irid.	Hem.	0			×	M. Su.	3½	

TABLE 2 (*Continued*)

Case No.	Age	Sex	Glaucoma		Type Surgery	Complications	Days to Surgery without Miotics	Reaction			Further Rx.	Period of Observation	Remarks
			Type	Years on Miotic Therapy				0	+	++			
39	69	Fw	N	20	Irid.	Sm. Hem.	6	×				1½	Other eye had successful Su for acute glau. 20 yr. before
40	76	Mw	N	1	Irid.		3	×				½	
41	76	Mw	N	1	Irid.	Hem.	8		×			½	
42	68	Fw	N	6	C.P.I.		4		×		Miotics Surg.	2	
43	69	Fw	N	7	S.T.I.	Hem.	7		×			½	
44	58	Mw	N	9	P.I.		5			×	Miotics surg.	½	
45	65	Fw	N	1	S.P.I.		5	×				½	Retinal arterial disease
46	75	Fw	N	1	Irid.	Sh. Ch.	14			×		1	
47	76	Fw	N	3	S.T.I.	Sl. Hem.	4	×				½	
48	76	Fw	N	3	S.P.I.		8	×				½	
49	60	Mw	N	2	Irid.		4	×				1	Retinal vascular disease. Tension high 9 da. before surgery
50	67	Fw	N	10	S.P.I.		10	×				1½	
51	74	Mw	N	16	S.P.I.		4		×			1	
52	74	Mw	N	16	P.I.		7		×			1	
53	69	Mw	N	3 mo.	Irid.		5	×				½	
54	69	Fw	N	3 mo.	S.P.I.C.		5	×				2	
55	55	Mw	N	1 mo.	P.I.		5	×				1	
56	61	Fw	N	4 da.	S. Irid.	Sm. Hem.	7			×	Miotics	1½	
57	45	Fw	N	½	P.I.		10	×				1½	Acute glau. other eye
58	56	Mw	W	3 mo.	C.	Hypotomy	7	×				1½	Persistent hypot. since surg. in case of exophth.
59	56	Mw	W	3 mo.	C.	Hypotomy	10	×				1½	Persistent hypot. since surg. in case of exophth.
60	73	Mw	W	1 mo.	S.P.I.		8	×				1	
61	73	Mw	W	1 mo.	S.P.I.		12	×				1	
62	65	Mw	W	1	P.I.		7			×	Surg.	6	EST (two series)
63	71	Fw	W	1	Irid.		8	×				½	
64	71	Fw	W	1	Irid.	Hem.	13	×				½	
65	65	Mw	W	1	S.T.I.	Hem.	3		×		Miotics	1½	
66	57	Fw	W	3	S.P.I.		4		×			1½	
67	59	Fw	W	2	S.P.I.		7	×				½	
68	59	Fw	W	2	S.P.I.	Hem.	10	×				½	
69	61	Mw	W	½	S.T.I.		4	×				5	
70	61	Fw	W	½	Irid.		4	×				½	
71	68	Fw	W	12	P.I.		9	×				½	
72	63	Fw	W	6	S.P.I.	Hypotony	4	×				½	
73	63	Fw	W	6	S.P.I.	Hem. Sh. A.C.	8					½	
74	56	Fw	W	9	T.I.	Hem.	4		×			½	
75	50	Fw	W	3	T.I.		5	×				4	Other eye lost following glaucoma surgery

* Irid. = Iridencleisis; S = sclerectomy; p.i. = peripheral iridectomy; t.i. = total iridectomy; C = Cyclodialysis.

iridencleises in Group B, only two showed severe postoperative reactions and seven showed minimal (zero) reactions.

The above findings suggest that the type of surgery may not play as important a role in the postoperative reactions as has been thought. The cases seem to reflect the therapy or lack of therapy more than the type of surgery.

There were 24 cases of known glaucoma under miotic therapy at least three or more years. Of this number, nine belonged to Group A, six showed severe (++) reactions postoperatively and none showed zero or minimal reactions (zero). Of the 15 in Group B only two showed severe postoperative reactions and seven showed zero or minimal reactions postoperatively.

This would suggest that the severity of the glaucoma (separate from the duration of therapy and exclusive of acute stages) is not a marked, if any, factor in determining the response to surgery. In point are the two eyes of Mrs. B. Here the advanced glaucoma in the left eye with only an islet of field, less than 20/200 vision, and almost complete cupping (Case 23), gave a better response to similar surgery than did the fairly normal right eye (Case 24).

Of the 18 cases under miotic therapy three months or less before surgery, four needed further therapy. Of these, three belonged to Group A.

There were too few cases of hypotony or cases of shallow anterior chambers, alone or together, without hemorrhages, to justify an analysis. Of the four cases of hypotony, only one case belonged to Group A. Of the four cases of shallow anterior chamber, three cases belonged to Group A.

In Table 1 are shown some of the differences in the results and reactions following surgery in Groups A and B.

Table 1 shows that 50 percent of cases in Group A required either further miotic therapy or further surgery, while only 13.5 percent of cases in Group B required such further therapy. A second operation was required in nine of 38 cases in Group A or in 23.7 percent of cases, while only two of 37 cases or only 5.4 percent required further surgery in Group B. Postoperative reactions were much more numerous and much more severe in Group A than in Group B.

Summary and Conclusions

Attempts to improve the surgical results in glaucoma should consider the data presented. Such drugs as are necessary to control the tension without the use of miotics should be used before surgery. Early and frequent slitlamp examinations should be made postoperatively. Such drugs as steroids and mydriatics should be used postoperatively where indicated to decrease postoperative reactions.

The data presented suggest that the use of miotics may lead to a low-grade iridocyclitis which may increase the postoperative reactions in glaucoma. The few cases in Negroes suggest the possibility that this is even more particularly true in the darkly pigmented eye.

While the average postoperative observation period in cases of Group B (1.3 years) is less than that in cases of Group A (3.9 years), the data strongly suggest that elimination of the use of miotics before surgery for at least three days may improve the surgical results in glaucoma.

6360 Wilshire Boulevard (48)

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SCLERAL RIGIDITY AND TONOMETRY IN THE AGED*

JULIUS SCHNEIDER, M.D., MORRIS FELDSTEIN, M.D., AND ABRAHAM L. KORNZWEIG, M.D.

New York

Since 1952, we have been engaged in a study of the changes in the human eye associated with advancing years. As part of this survey, it seemed important to pay particular attention to tonometry and scleral rigidity in the aged as diagnostic aids in cases of glaucoma.

Ocular rigidity has been defined by Friedenwald[1] as the resistance which the eyeball offers to a change in intraocular volume. This resistance results in a rise in intraocular pressure as fluid volume is increased in the eye. Tonometry involves indentation of the cornea with a mechanical instrument which results in displacement of intraocular fluid and stretching of the ocular coats. Grant and Trotter[2] have shown that there is a parallel rise of intraocular pressure produced by distention and by tonometric distortion. When tonometry is done with two different plunger loads, the fluid displacement is greater with the heavier weight. The difference in rise of intraocular pressure produced by these weights is used as an index of scleral rigidity. Friedenwald[1] has previously shown that, when the pressures with the two weights agree fairly well, the eye is said to have normal rigidity. When the pressure with the heavier weight is higher, scleral rigidity is said to be elevated and the actual pressure in this eye is lower than the measurement shows. Lower pressure with the heavier weight indicates low scleral rigidity. In this instance, the true pressure is higher than both readings as taken with the tonometer.

The original collection of data for this survey was completed in 1954 and the tonometer readings were interpreted using the 1948 Schiøtz calibration scale. Considerable difficulty was experienced in finding consistency in our scleral rigidity results. In personal correspondence with Dr. Friedenwald, he indicated that there were certain discrepancies in the Schiøtz calibration scales. The pressure readings tended to be higher than normal with the heavier plunger

* From the Medical Service, The Home for Aged and Infirm Hebrews of New York. This work was supported by a grant (B-154) from the National Institutes of Health, National Institute of Neurological Diseases and Blindness, Bethesda, Maryland.

load resulting in large errors and inconsistencies. He stated that the Committee on Standardization of Tonometers was making a complete revision of the calibration tables and that our data should be reconsidered when the new tables became available.

The new report of the Committee on Standardization of Tonometers appeared in the January-February, 1957, issue of the *Transactions* of the American Academy of Ophthalmology and Otolaryngology. The study of scleral rigidity had been a difficult problem because of the many variables in the empirical constants. Other workers have emphasized that the coefficient of rigidity not only varies in different eyes but is not even constant in the same eye when measured at different times.

MacDonald[3] indicated that scleral rigidity may decrease with diurnal elevations of intraocular pressure in glaucomatous eyes. Kiritoshi[4] reported that the ocular rigidity is within the normal range in glaucoma, but that diurnal variations in rigidity are greater in glaucomatous than in normal eyes.

Friedenwald[1] cautioned against too close adherence to findings as taken from the rigidity tables. He indicated that the 1955 tables "represented a closer approach to the truth" because of the closer agreement of tensions with the two weights, but he also stated that the "true" tension as found according to these tables is grossly affected by the inherent error in the Schiøtz tonometer, the human element in taking measurements, and the large differences in the coefficient of rigidity found with small changes in Schiøtz scale readings.[5]

Our findings of scleral rigidity measurements in a large group of aged individuals will be discussed later in this report.

In the present study made on 1,526 eyes, we calculated the mean scale measurement with the 5.5-gm. weight to be 5.26, and with the 10.0-gm. weight to be 10.01. These paired mean scale measurements lie on the committee's plotted curve of relationship between the scale readings with these weights as reported by Kronfeld.[6] This finding adds further support to the validity of the 1955 calibration scale.

When we compare our scleral rigidity measurements using the 1948 and 1955 Schiøtz calibration scales, we note obvious differences. Table 1 shows the scleral rigidity findings with the 5.5 and 10.0-gm weights using the first tension measurements taken on each patient.

The original group of patients using the old Schiøtz scale included 1,618 eyes. Thirty-nine percent of these patients had high scleral rigidity. However, using the new scale which lowered the findings with the 10.0-gm. weight, there was a marked reduction in the elevated scleral rigidity percentage to 9.3 percent. The new scale has brought a closer agreement in tension measurements with the 5.5 and 10.0-gm. weights, as evidenced by the increase of normal rigidity and decrease of elevated rigidity findings. The obvious conclusion from this table is that age per se does not appear to produce increased scleral rigidity.

When scleral rigidity measurements were repeated, it was noted that the findings were not consistent with the Schiøtz tonometer. Dr. Kronfeld suggested that to reduce clinical reading errors to a minimum, either an electronic tonometer should be used or a large number of clinical measurements on each eye should be taken with the Schiøtz tonometer and the average of these meas-

TABLE 1

SCLERAL RIGIDITY FINDINGS

	Number of Eyes	Elevated Scleral Rigidity	Normal Scleral Rigidity	Decreased Scleral Rigidity
1948 Schiøtz Calibration	1,618	38%	57%	5%
1955 Schiøtz Calibration	1,526	9.3%	71.3%	19.4%

urements for each weight should then be applied to the rigidity table.

For this phase of the scleral rigidity study, all the initial two-weight tension measurements were reviewed. All patients who were in one of the following three categories were regarded as having possible and potential glaucoma; and tension measurements were repeated four times with the two weights on different days.

1. Where one tension with either weight was 26 mm. Hg or over.
2. Where there was a difference of tension of 3.0 mm. Hg or more with the two plunger loads in either eye.
3. Where there was a difference of 6.0 mm. Hg tension between both eyes with either weight.

Our study was completed in 1956, but the new scale of Schiøtz tensions was not published until February, 1957. When the data were reviewed in 1957, records of 770 patients were available. They ranged in age between 62 and 98 years with the large majority in the eighth and ninth decades. Tensions of the 1,526 eyes were taken with the two plunger loads. There were 166 patients (21.6 percent) who required tensions repeated four times because the initial measurements placed them in the group of possible and potential glaucoma according to the criteria listed above. On multiple testing of this group, 45 patients had at least one random tension of 26 mm. Hg or above to suggest the diagnosis of glaucoma. Of these 45 patients, using the initial tension measurements and the 1955 calibration scale, 46 eyes (51.1 percent) had average scleral rigidity, 13 eyes (14.4 percent) had high scleral rigidity and 31 eyes (34.4 percent) showed low scleral rigidity.

Throughout the survey, we encountered the disturbing observation that, when repeated two-weight tensions were taken, the findings were grossly inconsistent. The same eye would show average, elevated or decreased scleral rigidity when tested on different days with the Schiøtz mechanical tonometer. All measurements were made in the morning so that diurnal variation was not a significant factor in our findings. This inconsistency made the value of the test very questionable.

We proceeded to work up our suspicious cases of glaucoma. Many of our patients presented a problem in diagnosis. Where possible, field studies were done and contributed importantly to the diagnosis. Several patients were unable to co-operate sufficiently to obtain a reliable peripheral field because of mental or physical disability. Tonography was done on the possible and potential glaucoma patients and also on a group of normal controls and glaucoma patients under treatment. We did not attempt the water-drinking test because of the danger of cardiac decompensation.

All patients were dilated with one-percent paredrine routinely for funduscopy. In one unit of the institution, all tensions were taken with the pupils dilated with one-percent paredrine, except in known glaucoma cases. In another unit of the institution, tensions were measured without dilation. This afforded an opportunity for comparative study of the effect of mydriasis on tension. In the first unit, where the patients were dilated for tension measurements, a definite diagnosis of glaucoma was made in 10.1 percent of the residents. In the second unit where tensions were taken without mydriasis, 8.7 percent of the residents had a definite diagnosis of glaucoma. The over-all finding was a diagnosis of glaucoma in 9.6 percent of our patients. The percentage difference of cases of diagnosed glaucoma with and without paredrine mydriasis was found not to be statistically significant.

We had previously submitted a report of our tonometric findings on 1,618 eyes using the 1948 Schiøtz calibration scale.[7] Five percent of our aged population was found to have glaucoma. Another 10 percent were included in a group of possible and potential glaucoma. We believe that the increase from 5.0 to 9.6 percent of diagnosed glaucoma is due to the fact that frequent measurements of tensions were taken, and also that any

random tension of 26 mm. Hg was regarded as suspicious.

There have been many screening surveys to detect glaucoma. Becker[3] summarized these reports and indicated that in routine tonometric testing, 5.0 to 15 percent of patients over 40 years of age were suspected of having glaucoma. The final evaluation, however, showed only 0.8 to 7.0 percent of the total were diagnosed as having glaucoma, depending on the criteria and methods used in each series.

The higher percentage of glaucoma in our series of cases is undoubtedly due to the older age of our patients and also to the repeated measurements of intraocular pressure supplemented by the information obtained from tonography.

Discussion

Since Friedenwald presented his concept of scleral rigidity, there has existed the question whether this could be used as a practical clinical procedure. It was an important consideration because if scleral rigidity was found to be elevated in a particular eye, the actual tension according to Friedenwald should be lower than that obtained with either weight and an incorrect diagnosis of glaucoma could be avoided. On the other hand, should scleral rigidity be below normal, the true tension theoretically should be higher than that obtained with either weight and that individual might have glaucoma which could be missed. The tonometer used by most ophthalmologists is of the Schiøtz type. Our study was undertaken to see if scleral rigidity measurements with this instrument could be a useful clinical procedure and our elderly patients offered an opportunity to ascertain if aging in itself produces increased scleral rigidity.

The present survey of scleral rigidity utilized the new 1955 Schiøtz calibration scale. In this series, most patients showed fairly close agreement in two-weight tensions on initial testing. However, when we did frequent measurements with the Schiøtz tonometer on different days on the group of possible and potential glaucoma cases, marked variations in readings were noted. These differences were so marked that it was obvious that there was no significance in scleral rigidity findings taken with the Schiøtz tonometer. This is partly due to the limited accuracy of the mechanical tonometer, but more particularly, to clinical reading errors. Friedenwald had recognized these difficulties and suggested that, "Only care and frequent repetition of the clinical measurements can reduce the clinical reading error."[1]

From our experience, the advantage gained in taking multiple readings was that when one random tension of 26 mm. Hg was found with either weight, careful study was made to reach a definitive diagnosis. Twenty-six persons in this group of 45 possible and potential glaucoma cases were finally diagnosed as having true primary glaucoma. Of the 26 who were found to have glaucoma, there were six who could not be positively diagnosed until tonography was done.

In general, when there was a significant discrepancy between readings with two plunger loads, repeated measurements did not bear out this difference often enough to make the test a satisfactory clinical procedure.

Conclusions

1. Our findings give support to the belief that the 1955 Schiøtz calibration scale has produced better agreement between tension readings with the 5.5 and 10.0-gm. weights.

2. Scleral rigidity measurements with the mechanical tonometer are not consistent and of questionable reliability because of inherent deficiencies in the instrument and technique.

3. Readings with the two weights must be repeated on different days. A consistent trend toward increased or decreased scleral rigidity must be found to be significant. We have not found such a consistency in clinical practice in our series of cases.

4. The real value of the test for scleral rigidity for us has been increased emphasis on the necessity of taking repeated readings of intraocular pressures in suspicious cases.

5. Repeated tonometry plus more detailed testing on suspected cases has increased the incidence of the positive diagnosis of primary glaucoma from 5.0 to 9.6 percent in our series of 770 patients ranging in age from 62 to 98 years.

6. There does not appear to be an appreciable increase in scleral rigidity in aged patients.

11 East 68th Street (21).

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PRIMARY AND SECONDARY DEVIATION IN COMITANT SQUINT*

Martin J. Urist, M.D.
South Haven, Michigan

The finding of a greater amount of deviation when one eye fixes compared with the other has been called primary and secondary deviation. This finding has been stressed as diagnostic for paretic or incomitant squint. The fixing eye, producing the greater or secondary deviation, is the one which has the paretic muscle. The explanation for the difference in the deviation is that it takes a greater innervational impulse for the paretic muscle to hold the eye straight when it fixes. This increased innervation is transmitted to the yoke muscle in the opposite eye (Hering's law) which causes the greater deviation.

Costenbader[1] found that in certain cases of comitant squint with amblyopia there was primary and secondary deviation in that when the amblyopic eye fixed the deviation was greater than when the normal eye fixed. Swan[2] found that in some cases of comitant squint which were anisometropic or had had unilateral surgery a change in the magnitude or direction of the deviation was present with a change in fixation. He designated these cases as being incongruous comitant deviations. The primary and secondary deviations which occur in paralytic strabismus he called incongruous incomitant deviations.

The occurrence of primary and secondary deviation in comitant squint is not rare. It will be found more frequently the more one keeps this condition in mind and looks for

* From the Motility Clinic, Illinois Eye and Ear Infirmary, University of Illinois College of Medicine, Chicago.

random tension of 26 mm. Hg was regarded as suspicious.

There have been many screening surveys to detect glaucoma. Becker[8] summarized these reports and indicated that in routine tonometric testing, 5.0 to 15 percent of patients over 40 years of age were suspected of having glaucoma. The final evaluation, however, showed only 0.8 to 7.0 percent of the total were diagnosed as having glaucoma, depending on the criteria and methods used in each series.

The higher percentage of glaucoma in our series of cases is undoubtedly due to the older age of our patients and also to the repeated measurements of intraocular pressure supplemented by the information obtained from tonography.

Discussion

Since Friedenwald presented his concept of scleral rigidity, there has existed the question whether this could be used as a practical clinical procedure. It was an important consideration because if scleral rigidity was found to be elevated in a particular eye, the actual tension according to Friedenwald should be lower than that obtained with either weight and an incorrect diagnosis of glaucoma could be avoided. On the other hand, should scleral rigidity be below normal, the true tension theoretically should be higher than that obtained with either weight and that individual might have glaucoma which could be missed. The tonometer used by most ophthalmologists is of the Schiøtz type. Our study was undertaken to see if scleral rigidity measurements with this instrument could be a useful clinical procedure and our elderly patients offered an opportunity to ascertain if aging in itself produces increased scleral rigidity.

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MARTIN J. URIST, M.D.
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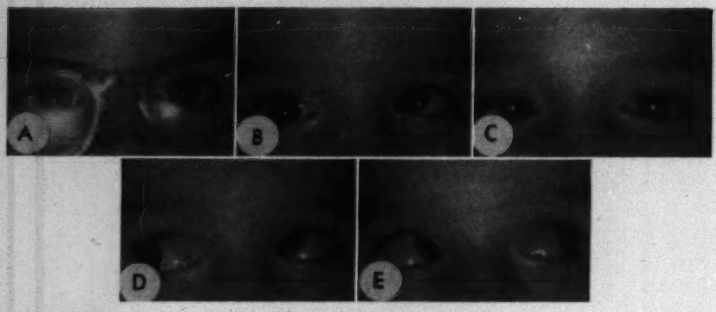

Fig. 1 (Urist). Case 1.

a. Slight esotropia with glasses.
b. Twenty-five degrees left esotropia, 10 degrees left hypertropia with the right eye fixing.
c. Fifteen degrees of right esotropia with the left eye fixing.
d. and e. Bilateral elevation in adduction, greater on gaze to the right.

it. It is the purpose of this paper to present and discuss some cases showing this interesting but not too well-known phenomenon.

CASE 1 (5-49)

A girl, aged five years, came to the infirmary in August, 1958, with a history of the eyes being crossed since three years of age. Refraction with atropine cycloplegia was: O.D., +3.0D. sph. ⌒ +1.25D. cyl. ax. 100° = 20/50; O.S., +2.75D. sph. ⌒ +0.5D. cyl. ax. 80° = 20/20.

Examination (fig. 1) revealed the eyes nearly straight with glasses. Without glasses, anisotropia* was present: about 15 degrees of esotropia when the left (20/20) eye fixed and 25 degrees of esotropia and 10 degrees of left hypertropia when the right (amblyopic) eye fixed. Bilateral elevation in adduction was present.

Comment. This was a case of accommodative esotropia that was mistakenly diagnosed as of paretic origin because of the primary and secondary deviation. Actually it was the type of case described by Costenbader[1] in which the deviation with the amblyopic eye fixing was greater than with the normal eye. Costenbader believed that the condition was due to a greater accommodative effort when the amblyopic eye fixed. Although in this case bilateral elevation in adduction was present, a left hypertropia was more manifest (fig. 1).

The explanation for the left hypertropia is that in cases of horizontal squint with secondary vertical deviations the more the eye is adducted, or the greater the esotropia, the greater the vertical deviation. The finding of a unilateral hypertropia in a case of bilateral elevation or depression in adduction would indicate, in some cases, the presence of anisotropia.

CASE 2 (1-243)

A boy, aged five years, came to the infirmary on February 15, 1948, with a history of the left eye turning in since the age of two and one-half years. Refraction with atropine cycloplegia was: O.D., +7.0D. sph. ⌒ +0.5D. cyl. ax. 120° = 20/30; O.S., +7.5D. sph. ⌒ +2.0D. cyl. ax. 75° = 20/200.

After complete occlusion of the right eye, the vision in the left eye improved to 20/30. Examination on November 8, 1950, (fig.2—a,b,c) revealed that with glasses there was 20 degrees of left esotropia. Without glasses, with the right eye fixing, 30 degrees of esotropia was present and the pupils were two mm. in diameter. When the left eye fixed the pupils dilated to four mm. and the esotropia decreased to 20 degrees. Over the years, with the wearing of the lenses the esotropia gradually improved but the anisotropia did not improve.

At the last examination, seven years later, on March 6, 1957, (fig. 2—d,e,f,g), the following interesting findings were observed. Vision in the right eye was 20/20, in the left, 20/50. When the right eye fixed for near 10 degrees of left esotropia was present with glasses and 20 degrees without. The pupils were about three mm. in diameter. When the left, amblyopic eye fixed, five degrees of right exotropia was present with glasses and the eyes could be straight without. In the left eye the size of the pupil changed from five mm. with glasses to six mm. without glasses.

Comment. In contradistinction to Case 1, there was less esotropia with the amblyopic

* Unequal deviation comparing one eye fixing with the other.

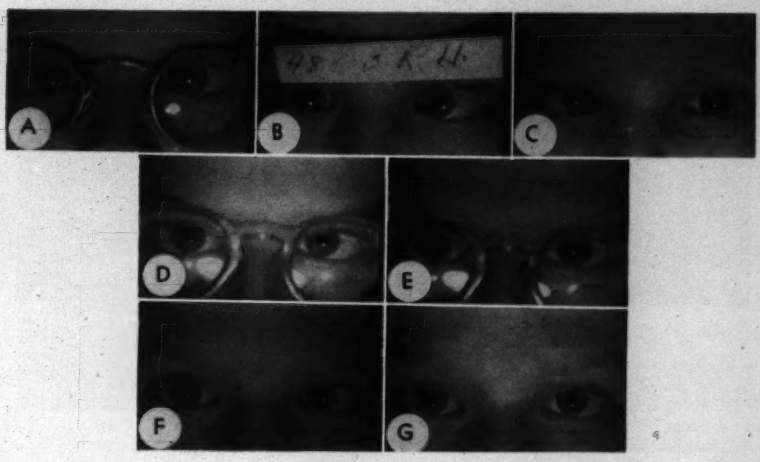

Fig. 2 (Urist). Case 2. Poses a, b, and c taken in 1950. Poses d, e, f, g taken in 1957.

a. Twenty degrees of left esotropia with glasses.
b. Thirty degrees of left esotropia for near (two mm. pupil).
c. Twenty degrees of right esotropia for near (four mm. pupil).
d. Ten degrees of left esotropia with glasses for near (three mm. pupil).
e. Slight exotropia with glasses with left eye fixing (five mm. pupil).
f. Twenty degrees of left esotropia for near (four mm. pupils).
g. Eyes straight with left eye fixing (six mm. pupils).

eye fixing. This difference was maintained even though, at the last examination, an exotropia could be present with the amblyopic eye fixing while an esotropia was present with the normal eye fixing. The cause for the anisotropia became apparent when the near reflex was studied. When the amblyopic eye fixed a light for near there was less convergence and less constriction of the pupil and one could then infer that there was less accommodation. This was confirmed when the accommodation was measured. With the amblyopic eye the print blurred at 15 cm. while with the good eye it blurred at 10 cm. Also, when forced to read with the amblyopic eye the esotropia became greater than when fixing a light.

CASE 3 (5-21)

A woman, aged 30 years, was first seen at the infirmary on June 24, 1958. She gave a history of crossed eyes of unknown duration and headaches after near work for the past few months with diplopia at times. Refraction with Cyclogel cycloplegia was: O.D., +2.75D. sph. = 20/30; O.S., +0.5D. sph. ⌒ +0.75D. cyl. ax. 180° = 20/20.

Examination revealed a most interesting form of anisotropia: a definite esotropia with cover measurements of seven prism diopters when the right eye was used for distance fixation and a definite exotropia with cover measurements of 18 prism diopters when the left eye was used for near fixation. On the Troposcope, third grade fusion was present at nine prism diopters base-out.

As can be seen in Figure 3, when fixing with the left eye for near there was about 15 degrees of right exotropia and hypertropia. The left pupil was four mm. in diameter and the right pupil, six mm. When forced to fix with the right eye for near, which she did with great effort, about 15 degrees of esotropia was present and the pupils were equal about two mm. in diameter. Bilateral elevation in adduction was present. A check of the accommodative ability with correction showed it to be unequal, with eight diopters of accommodation in the left eye and only three diopters in the right. She was given a +1.0D. lens for the right eye and a —1.5D. lens for the left which made her more comfortable for reading. The exotropia for near of 18 prism diopters improved to an exophoria of four prism diopters while the esotropia was unchanged.

Comment. In this patient the following differences between the two eyes were probably the cause of the anisotropia. The right eye was slightly amblyopic, had a greater

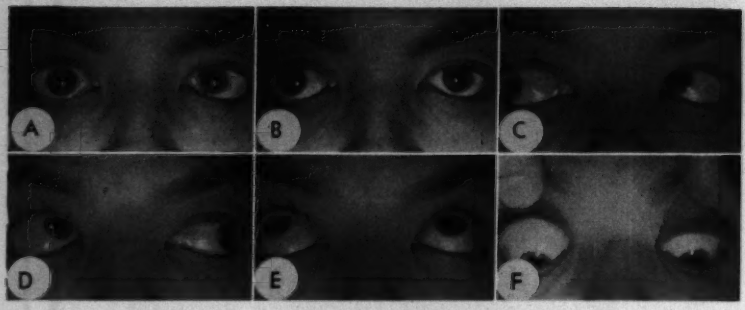

Fig. 3 (Urist). Case 3.

a. Ten to 15 degrees of left esotropia with right eye fixing on a small letter.
b. Fifteen degrees of right exotropia and hypertropia with the left eye fixing on a small letter.
c. and d. Bilateral elevation in adduction.
e. Twenty degrees of exotropia looking up.
f. Straight, looking down.

hypermetropia and had much less accommodation than the left eye. The pathologic physiology most likely was as follows: when the right eye fixed, by reading a small letter, it took a large accommodative effort because of the small amount of accommodation. This excess innervation was transmitted into the other components of the near reflex and produced constricted pupils and marked convergence. When the left eye fixed it took little accommodative effort because of the large accommodative reserve. This amount of accommodation produced insufficient accommodative-convergence to hold the eyes straight. This small amount of innervation, when transmitted to the other components of the near reflex, resulted in dilated pupils, poor convergence and the development of an exotropia. When an exotropia was present it was interesting to note that the right pupil was larger than the left pupil (fig. 3-b), probably indicating unequal accommodation. Although bilateral elevation in adduction was present, the elevation of the right eye was the greater when it became exotropic, a common finding in cases of horizontal squint with secondary vertical deviations, as the more dissociated eye develops the greater vertical deviation.

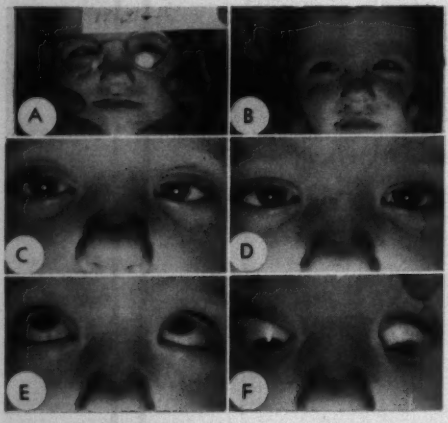

Fig. 4 (Urist). Case 4. Poses a and b taken October, 1947. Poses c, d, e, and f taken in December, 1949.

a. Twenty degrees of right esotropia with glasses.
b. Twenty five degrees of left esotropia without glasses.
c. Fifteen degrees of left esotropia.
d. Fifteen degrees of right esotropia.
e. Fifteen degrees of left esotropia looking up.
f. Straight looking down.

The treatment was predicated on the idea of stimulating accommodative-convergence with the left eye fixing. This would improve the exophoria-tropia and alleviate the asthenopia. Lenses were selected in the following manner. With both eyes open the patient was asked to read fine print. Minus lenses of

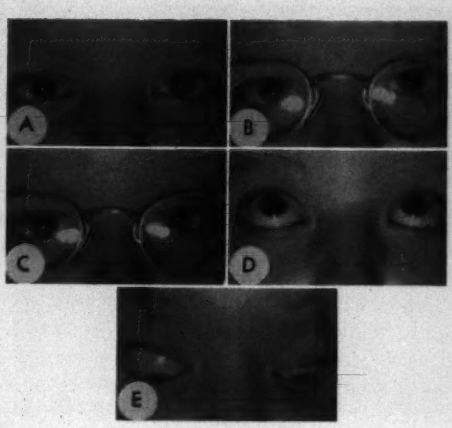

Fig. 5 (Urist). Case 4. July 9, 1952.

a. Ten degrees of right esotropia without glasses.
b. Ten degrees of right esotropia with glasses.
c. Five degrees of left esotropia with glasses.
d. Straight, looking up.
e. Slight exotropia looking down.

increasing power were placed before the left eye until she had the clearest and most comfortable vision. A −1.5D. sph. was the choice. Wearing a −1.5D. sph. over the left eye and keeping both eyes open, it was found that a +1.0D. sph. over the right eye was most comfortable for reading. With the wearing of this correction the exotropia improved and her asthenopia was relieved.

CASE 4 (1-95)

A girl, aged three and one-half years, came to the infirmary in October, 1947, with a history of alternating esotropia since birth. Refraction with atropine cycloplegia was: O.D., +0.75D. sph. ⌒ +0.5D. cyl. ax. 130° = 20/30; O.S., +0.75D. sph. ⌒ +0.75D. cyl. ax. 90° = 20/30.

A variable esotropia of about 20 degrees (fig. 4—a,b) was present with and without glasses. Over the years, with the wearing of the above lenses, the esotropia gradually decreased. In 1949, about 15 degrees of esotropia was present (fig. 4—c,d,e,f). In 1952 about five to 10 degrees was seen (fig. 5) and, in 1954, the eyes could be straight with and without glasses. With the straightening of the eyes the findings changed from esotropia to straight eyes looking up and from straight eyes to an exotropia looking down. On October 25, 1956, the eyes were seen to be divergent about five degrees. Vision was 20/30 in the right eye and 20/100 in the left eye. Refraction with atropine cycloplegia revealed that myopia had developed which was unequal in the two eyes.

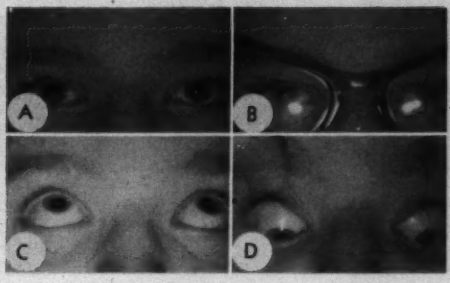

Fig. 6 (Urist). Case 4. January, 1957.

a. Slight right exotropia with the left eye fixing.
b. Straight, with glasses.
c. Ten degrees of exotropia looking up.
d. Ten degrees of exotropia looking down.

Each eye was corrected to 20/20, the right with a −0.75D. sph. and the left with a −2.5D. sph. ⌒ + 1.0D. cyl. ax. 45°. These lenses were prescribed. With these lenses the eyes were straight most of the time but an exotropia was present intermittently and with increasing frequency. Without glasses exotropia was present all the time in the primary positions as well as straight up and straight down (fig. 6). Cover measurements were: c/c XT 5Δ, RH 2Δ; XT′ 4Δ. Second grade fusion was present on the Troposcope at eight prism diopters base-in. Because of the exotropia the lenses were empirically increased to: O.D., −1.75D. sph. ⌒; O.S., −3.5D. sph. ⌒ + 1.0D. cyl. ax. 45°.

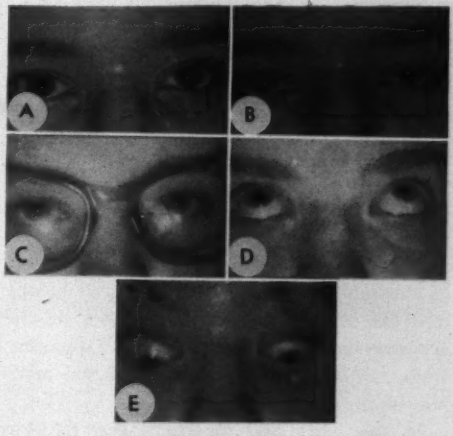

Fig. 7 (Urist). Case 4. August, 1958.

a. Slight right exotropia with the left eye fixing.
b. Slight left esotropia with the right eye fixing.
c. Five degrees of left esotropia with glasses.
d. Straight, looking up.
e. Ten degrees of extropia looking down.

Fig. 8 (Urist). Case 5. Poses taken in 1948.

a. Ten degrees of left esotropia with the right eye fixing.
b. Elevation of the right eye in adduction.
c. Eyes level on gaze to the right.

In August, 1958, (fig. 7) five degrees of left esotropia was present with the new correction. Cover measurements had changed to: c/c ET 10Δ; ET′ 12Δ. s/c ET 8Δ, ET′ 2Δ. First grade fusion was present on the Troposcope at eight prism diopters base-out. Without glasses, for the first time, we noticed that anisotropia had developed. When the less myopic right eye fixed, a slight esotropia of the left eye was present, demonstrated by a movement out to take up fixation. When the more myopic left eye fixed, a definite exotropia of the right eye was present, confirmed by a movement in to take up fixation. With the cover-uncover test of each eye no movement was seen.

Comment. This patient clearly showed that primary and secondary deviation can develop in a case where the deviation was originally the same with each eye fixing. When first examined in 1947, at the age of three and one-half years, there was 20 degrees of esotropia with each eye fixing with and without glasses (fig. 4). It certainly was not an accommodative squint by our usual criteria since it started at birth, was alternating and the deviation was little affected by the small hyperopic correction. Then the picture changed; unequal myopia developed. With this change in the refraction the accommodative effect on the deviation of the eyes became marked and exotropia developed. With the wearing of the minus lenses the eyes became straight. Without glasses anisotropia was present showing the effect of unequal accommodation produced by the unequal refraction. The importance of the accommodative factor became apparent, when, with the overcorrection of the myopia, esotropia again developed.

In this case, and in others that develop myopia (see Cases 5 and 7), there develops an insufficiency of accommodative-convergence. This is reflected in development of an exodeviation which becomes progressive as the myopia increases. A clue to the total amount of the myopia that will develop is given by the amount of myopia in the parents and other relatives. In this case the mother wore −7.0D. lenses and probably the daughter will do the same. In my experience, in some cases of progressive myopia it is insufficient to give the full atropine correction since it appears that the exodeviation is also progressive and anticipates further progression of the myopia and therefore is not controlled. Only when the myopia is overcorrected by a −1.0D., −2.0D. or −3.0D. sph. can the exodeviation be controlled. It is remarkable how well the patients see and adjust to this overcorrection.

Case 5 (2-188)

A girl, two and one-half years came to the infirmary on July 22, 1948, with a history of the left eye being crossed since the age of two months. It was also noticed that at times the right eye would turn in and up. She was born two months prematurely. Refraction with atropine cycloplegia was: O.D., −4.0D. sph.; O.S., +3.0D. sph. This correction was prescribed.

Examination in 1948 (fig. 8) revealed 10 to 15 degrees of esotropia with the right eye deviated most of the time. There was marked elevation of the right eye in adduction. On July 6, 1950, the vision was 14/200 in the right eye and 20/30 in the left. Refraction had changed to a −9.0D. sph. in the right eye while it remained a +3.0D. sph. in the left. With the new correction vision in the right eye was 20/100. On December 8, 1954 (fig. 9), the eyes could be straight with and without glasses in all positions and the elevation of the right eye in adduction and disappeared. Vision was 20/200 in the right eye and 20/30 in the left.

On June 6, 1956 (fig. 10), examination revealed 20 degrees of right exotropia was present with glasses and about five degrees without. There was 10 to 15 degrees of exotropia looking down and about five degrees looking up. Cover measurements without glasses were: XT 16Δ, LH 5Δ; XT′ 24Δ, LH′ 2Δ or RH′ 2Δ. Because of the exotropia the +3.0D. sph. was removed from the left eye and replaced with a −1.0D. sph. One month later, on July 10, 1958 (fig. 11), examination showed the eyes to be straight with glasses and vision to be 20/200 in the right eye and 20/20 in the left. Without glasses

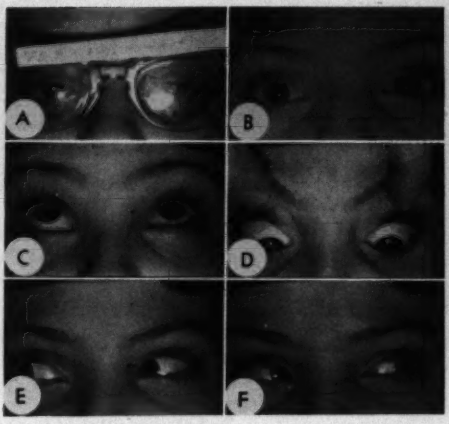

Fig. 9 (Urist). Case 5. December 8, 1954.

a. Straight with glasses.
b. Straight without glasses.
c. Straight, looking up.
d. Straight, looking down.
e. and f. Level in lateral gaze.

anisotropia was found because we were on the look-out for it and forced the myopic amblyopic right eye to fix, which it did with difficulty. When it fixed there was 10 to 15 degrees of exotropia for distance and near. With the left hyperopic eye fixing 10 degrees of esotropia was present for near and five degrees of exotropia for distance.

Comment. When this patient was first seen in 1948 at the age of two and one-half years, marked anisometropia was present; the right eye was myopic and the left eye hypermetropic. With this amount of anisometropia one could reasonably assume there was a difference in the amount of esotropia present with each fixing although it was not obvious and not carefully examined for at this time. However, reasoning backward, the mechanism would be as follows: Without glasses the left eye, being hypermetropic, certainly would have to accommodate more than the right myopic eye. This would tend to produce a greater esotropia as demonstrated in the previous cases. The presence of pronounced elevation of the right eye in

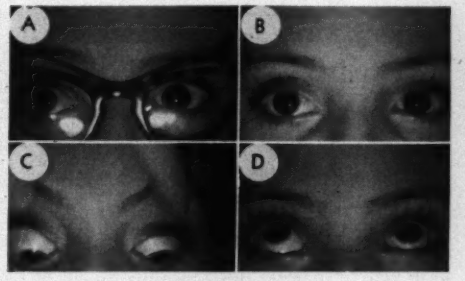

Fig. 10 (Urist). Case 5. June 6, 1956.

a. Twenty degrees of right exotropia.
b. Five degrees of right exotropia for distance.
c. Ten degrees of left exotropia looking down.
d. Five degrees of right exotropia looking up.

Fig. 11 (Urist). Case 5. July 10, 1958.

a. Straight with glasses.
b. Five to 10 degrees of right esotropia for near.
c. Five degrees of right exotropia for distance.
d. Ten to 15 degrees of left exotropia for near and distance.

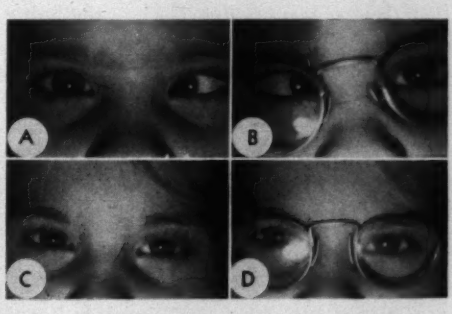

Fig. 12 (Urist). Case 6. a and b, preoperative. c and d. Ten months after a 5.0-mm. recession of the left medial rectus and an 8.0-mm. resection of the left lateral rectus muscle.

a. Twenty-five degrees of left esotropia without glasses.
b. Twenty-five degrees of right esotropia with glasses.
c. Ten degrees of right esotropia without glasses.
d. Straight with glasses.

Fig. 13 (Urist). Case 6. February 13, 1958, seven years after surgery.
a. Straight with glasses.
b. Right eye fixing, five degrees of left exotropia.
c. Right eye fixing, eyes straight.
d. Left eye fixing, 20 degrees of right esotropia.
e. Left eye fixing, 15 degrees of right esotropia.

adduction may have indicated that it had more esotropia, as in Case 1. Some evidence for this was that with the straightening of the esotropia the elevation of the right eye in adduction disappeared.

With the development of more myopia and amblyopia in the right eye over the years, the left eye became the constantly fixing eye and the esotropia, with the left eye fixing, was well controlled with the wearing of a +3.0D. lens. This condition remained until the child became 11 years of age and entered the period of puberty with its rapid changes, when exotropia developed, a sign that changes were taking place in the fixing left eye. Because of the exotropia and anticipating the development of myopia in the hyperopic left eye she was given a −1.0D. sph. to wear all the time. Wearing this correction vision was 20/20 and the eyes became straight. On April 9, 1959, refraction of the left eye was a −1.0D. sph.

CASE 6 (3-282)

A girl, aged four years, came to the infirmary on May 9, 1951, with a history of the eyes being crossed since one year of age. Refraction with atropine cycloplegia was: O.D., +2.0D. sph. ⌒ +0.75D. cyl. ax. 90° = 20/20; O.S., +2.5D. sph. ⌒ +0.5D. cyl. ax. 90° = 20/20.

About 20 to 25 degrees of alternating esotropia was present with and without glasses (fig. 12—a,b). Cover measurements were: c/c ET 47Δ; ET′ 54Δ. s/c ET 54Δ; ET′ 54Δ. At surgery, on December 7, 1951, a five-mm. recession of the left medial rectus and an eight-mm. resection of the left lateral rectus muscle were done. Postoperative examination on October 28, 1952, 10 months after surgery (fig. 12—c,d), revealed the eyes to be straight with glasses with about 10 degrees of right esotropia without glasses. Cover measurements were: c/c XT 10Δ; XT′ 5Δ. s/c ET 4Δ; ET′4Δ. With the Troposcope second grade fusion was present at 0. Because of the exotropia measurements, the glasses were reduced one diopter to the following correction: O.D., +1.0D. sph. ⌒ +0.75D. cyl. ax. 90° = 20/20; O.S., +1.5D. sph. ⌒ +0.5D. cyl. ax. 90° = 20/20. Wearing this correction the eyes remained straight.

When seen on February 13, 1958 the following interesting findings had developed. The vision in the right eye was 20/60 while in the left eye it was 20/20. Refraction with atropine cycloplegia revealed that the right eye had become myopic; a −1.75D. sph. improved vision to 20/20. The left eye still was hyperopic requiring a +0.75D. sph. +0.75D. cyl. ax. 110° with which 20/20 vision was obtained. Wearing this correction the eyes were straight (fig. 13). However, without glasses there was a marked change in the squint depending on which eye fixed. With the right, myopic eye fixed the eyes varied from straight to five degrees of left exotropia. With the left, hyperopic eye fixing, 15 to 20 degrees of right esotropia could be present.

Comment. This case also showed the profound effect of puberty on the refraction with the resultant changes in the accommodation and position of the eyes. When first seen in 1951, at the age of four and one-half years, an alternating esotropia of 20 to 25 degrees, the same with each eye fixing, was present. There was practically no accommodative component since the squint was the same with and without glasses.

Fig. 14 (Urist). Case 7.

a. Straight with glasses. b. Ten degrees of right esotropia, left eye fixing. c. Straight for near without glasses.

After surgery a small accommodative component was present as the eyes became straight with glasses and about 10 degrees convergent without them. In 1948, at the age of 11 years, the effect of puberty changes on the eyes became demonstrable. The right eye changed from a +2.0D. sph. to a −1.75D. sph. while the left eye changed from a +2.5D. sph. to a +0.75D. sph. This unequal change had a pronounced effect on the position of the eyes with each eye fixing. With glasses the eyes were straight; without glasses anisotropia was now present due to the anisometropia and unequal accommodation.

CASE 7 (39)

A girl, aged eight years, came to the infirmary in January, 1950, with a history of diplopia and crossed eyes following surgery to the right eye. Before surgery, according to information obtained from another clinic, she had an intermittent exotropia-phoria. Refraction was: O.D., −4.0D. sph. ⌒ +1.0D. cyl. ax. 90° = 20/20; O.S., +1.25D. sph. ⌒ = 20/20.

The convergence nearpoint was 150 to 200 mm. and stereopsis was present on the major amblyoscope. She was wearing the above correction. In September, 1948, a four-mm. recession of the right lateral rectus muscle was done. Examination at the Infirmary in October, 1950 (fig. 14), two years after surgery, revealed straight eyes and stereopsis with glasses. The refraction had changed in the right eye to −9.0D. sph. ⌒ +2.0D. cyl. ax. 95° = 20/40. Refraction in the left eye was still a +1.25D. sph. Without glasses the left eye fixed for distance and there was about 10 degrees of right esotropia with diplopia. For near the eyes were straight with no diplopia. The mother was disturbed because when the child took her glasses off estropia was present whereas before surgery the eyes were straight for distance without glasses.

Comment. In this case anisometropia was present with developmental increase in the myopia of the right eye only. This appeared to follow the same pattern of uniocular increase in myopia as in Case 5. Anisotropia must have been present and this case demonstrated the importance of knowing the deviation with each eye fixing. The findings most likely were that when the left hyperopic eye fixed for distance the eyes could have been straight or slightly exophoric. For near the right eye fixed, where, because of the myopia, an exophoria-tropia was present. In the presence of these findings surgery was contraindicated before a trial of increased minus lenses was given. In these cases of progressive myopia, giving the least amount of minus lenses for 20/20 vision does not completely correct the exodeviation. As in Cases 4 and 5, it is important to anticipate the increase in myopia and overcorrect the patient. I would have prescribed, instead of a −4.0D. sph. ⌒ +1.0D. cyl. in the right eye, a −6.0D. sph. ⌒ +1.0D. cyl. In the left eye I would have prescribed, instead of the +1.25D. sph., a −1.0D. sph. This possibly would have controlled the exodeviation without requiring surgery.

SUMMARY AND CONCLUSIONS

1. In contrast to cases of incomitant squint, where primary and secondary deviations are due to unequal innervation of the extraocular muscles, in cases of comitant squint they are due to unequal innervation of the intraocular muscles.

2. Comitant squints can develop accommodative primary and secondary deviations with the advent of unequal accommodation produced by amblyopia, unequal refractive

changes and possible unequal development of the ciliary muscle.

3. Depending on the type of squint with each eye fixing the treatment would be to influence the amount of accommodative-convergence by the proper lenses, cycloplegics or miotics which must be applied to each eye separately.

3. In the special type of case where insufficiency of accommodative-convergence developed, as in progressive myopia, it was found insufficient to give the full atropine myopic correction to control the exodeviation. This was because the exodeviation was progressive, apparently anticipating the progression of the myopia. Only when the myopia was overcorrected, with resultant stimulation of accommodation-convergence, was the exodeviation controlled.

432½ Phoenix Street.

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DEXAMETHASONE IN OPHTHALMOLOGY*

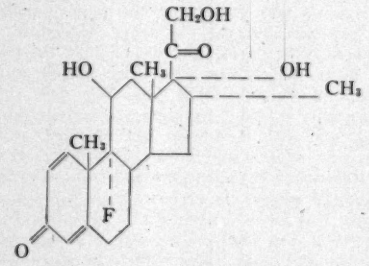
Dan M. Gordon, M.D.
New York

Dexamethasone, a new adrenocortical steroid, has been used since May, 1958, in the treatment of a group of 67 patients with various inflammatory intraocular conditions. Our preliminary observations indicate that the synthesis of dexamethasone, obtained by addition of a methyl radical at carbon 16 and a fluorine atom at carbon 9 of the prednisolone structure, constitutes a definite advance in the field of corticosteroid-responsive ocular conditions.

According to early reports, dexamethasone is said to have approximately six times the potency of prednisone or prednisolone, and 30 times that of cortisone; [1,2] certain of the undesirable side-effects seen with the earlier corticosteroids seem to be greatly decreased in incidence with dexamethasone.[3,4]

Chemistry

Dexamethasone (9-alpha-fluoro-16-alpha-methyl-11-beta, 17-alpha, 21-trihydroxy-1, 4-pregnadiene-3, 20-dione) is a synthetic analogue of prednisolone with the following structural formula:



Dexamethasone

Dexamethasone possesses a high degree of anti-inflammatory activity, approximately 6.5 times that of prednisone or prednisolone,

* From the New York Hospital-Cornell Medical Center and The L. Margolyes League. The dexamethasone used in this study was furnished, as Deronil®, through the courtesy of Harry V. Pifer, Jr., M.D., Schering Corporation, Bloomfield, New Jersey, and as Decadron through the courtesy of Dr. N. Capeci, Merck-Sharp and Dohme Co., West Point, Pennsylvania. All of the topical Dexamethasone was supplied as Decadron.

and 30 to 40 times that of cortisone. Its mineralo-corticoid activity is much lower than that of cortisone, prednisone or prednisolone; no sodium or water retention was seen with therapeutic dosages. Metabolic balance studies have shown that animals on controlled and limited protein intake will exhibit nitrogen loss on exceedingly high dosage; this has, however, not been demonstrated on dosages within the therapeutic range.

Clinical evaluation

Dexamethasone was given to 67 patients with corticosteroid-responsive ocular conditions. The therapeutic regimen was essentially the same in all patients; that is, relatively high initial dosages (up to 3.5 to 4.5 mg.) were used. These dosages were discontinued at the earliest possible time in acute conditions, and gradually decreased to maintenance levels in chronic processes. If the patient exhibited any sign of a flare-up, dosage was immediately increased until the exacerbation was under control.

Uveitis

Iridocyclitis. Five patients with acute iridocyclitis were treated with dexamethasone, 1.6 to 3.0 mg. daily, for periods ranging from five days to six weeks. All five responded satisfactorily, with no side-effects from the corticosteroid. In one of these cases the uveitis followed trauma; there was no delay in the absorption of the accompanying hyphema.

Seven patients with recurrent anterior uveitis received dexamethasone, in initial dosages of 3.0 mg. daily, given in divided doses. The response was highly satisfactory in all seven cases. The longest period of treatment was four months.

Choroiditis. Three patients with acute choroiditis responded well to essentially the same dosage regimen as given to the preceding seven cases. One patient required treatment with dexamethasone for six weeks, and another for three months. The third patient has had a fluctuating response; the result must be considered equivocal at this time.

Six patients with recurrent choroiditis, including two cases of choroiditis juxtapapillaris, responded dramatically to dexamethasone. In our experience choroiditis juxtapapillaris is usually a difficult disease to manage. The duration of therapy is generally longer than that required in lesions of similar appearance located in other areas of the choroid.

Four patients with long-standing chronic choroiditis received dexamethasone. In one of these cases vision was 8/200 at the initial examination, and the density of the vitreous membranes prevented examination of fundus detail. This patient failed to respond after a trial period of two months on dexamethasone, 4.0 mg. daily. Another patient responded initially with improvement of vision from 20/80 to 20/50, and then fluctuated irregularly; this patient had previously been on triamcinolone with a similar response, and then developed marked muscle weakness. After approximately one month on dexamethasone he again complained of muscle weakness, in milder degree, however; this reaction disappeared gradually. When the patient appeared to be responding satisfactorily, he developed new lesions and, despite all efforts, lost vision in the affected eye.

A difficult case

The following case illustrates the management of an unusually difficult problem.

M. O., a woman aged 71 years, was first seen on August 28, 1957, as a referral. She had had choroiditis in the left eye since April; she had been on prednisolone, 10 mg., since that time. Her vision in the affected eye was 20/80 with glasses. She exhibited considerable anterior and posterior uveitic reaction. There was a vague yellow area occupying most of the superior quadrant, and a similar area just above the macula.

She was placed on prednisone, 40 mg. daily; this dosage was slowly tapered down. Six weeks later she returned with vision of 20/200 and an exacerbation of symptoms. She had abruptly discontinued medication 48 hours before.

The patient was hospitalized for three and one-half weeks and placed on intravenous ACTH;

vision improved to 20/70. She was discharged on prednisolone, 60 mg. daily; this dosage again was gradually tapered down to 25 mg. daily. Five weeks later her vision was 20/80. She had a marked cushingoid syndrome and was given chlorothiazide orally and mercuhydrin sodium intramuscularly. She was instructed to keep her usage of salt to a minimum. This regimen controlled her water retention. Several subconjunctival injections of hydrocortisone were given at various times.

The patient returned a month later; vision had deteriorated to 20/200. She was then placed on 6-methyl-prednisolone, 24 mg. daily. Seven weeks later her vision had improved to 20/60, and the lesions started to harden. When she complained of weakness, the dosage was slowly decreased. Six weeks later her vision was 20/70. She had lost 12 pounds but did not feel as weak as on the occasion of the last visit.

Two months later vision regressed to 20/200, with exacerbation of all findings. The patient was then started on dexamethasone, 4.0 mg. daily for one week, after which dosage was reduced by decrements of 0.5 mg. weekly. Three weeks later vision had improved to 20/60, with the lesions again hardening.

Three weeks later (July 28, 1958) her vision was 20/50. She complained of some chest pains. Dosage was then decreased to 1.0 mg. daily, by decrements of 0.5 mg. every two weeks. On September 16, 1958, vision still was 20/50, and the lesions were hard. On October 20th, dosage was reduced to 0.5 mg. daily. On November 17th she was corrected to 20/40; it was felt that 20/40 was the maximum possible vision, since the lesion had affected the macula. In view of the improvement all medication was discontinued.

Generalized uveitis. A patient with severe, acute retinal periarteritis and generalized uveitis, and 20/80 vision, presented a hazy vitreous. He had been placed on prednisone, 30 mg. daily, when first seen. The patient was transferred to dexamethasone, 3.0 mg. daily, with excellent response within one week. The period of treatment was 10 weeks, and vision has improved to 20/20.

Twenty patients with chronic generalized uveitis were treated with dexamethasone. The uveitis was brought under excellent control in 18 of these cases; one patient developed marked edema, requiring transfer to an alternate corticoid, and another must be considered a failure at this time. Five patients developed edema in varying degrees. Water retention was controlled in most cases by administration of chlorothiazide, 500 mg. once or twice daily or every other day. In the more severe reactions, intramuscular injection of mercury, 2.0 cc. every week or every other week, proved of great value.

It should be pointed out that the intensity and duration of treatment in chronic uveitis exceed those seen in most medical diseases, and that the probability of eliciting side-effects is thus greatly increased.

Neuritis

A patient with an acute generalized uveitis and bilateral optic neuritis responded extremely well to dexamethasone, given for one month.

A woman patient with retrobulbar neuritis, whose vision had been reduced to hand movements, responded to dexamethasone within 48 hours. Treatment was continued for approximately two weeks when vision became normal. After discontinuation of treatment at the patient's request, there was a prompt relapse of vision to approximately 20/50. When dexamethasone was reinstituted there was again immediate and continued improvement to 20/15−. Treatment was continued for an additional six weeks at lower dosage.

A patient with a chronic optic neuritis of one year's duration in one eye and of several months' duration in the other eye is responding quite well to dexamethasone, with marked improvement in vision and reduction of edema within the nerve.

Corneal transplant

A patient, who underwent a nine-mm. corneal transplant, had an intense postoperative reaction, including a severe uveitis; he was successfully managed on dexamethasone, given for a period of over two months.

Coats' disease

A patient with Coats' disease was treated for six weeks with dexamethasone. There was no improvement in his condition; none

had been expected. Two other patients with burned out chronic uveitis were treated for approximately three months, with no improvement in vision.

Behçet's syndrome

A male patient with Behçet's syndrome, who had failed previously on prednisone and who had been managed only on massive doses of ACTH (120 to 200 units daily), responded to dexamethasone, 4.0 mg. daily in the same degree as to ACTH.

Macular degeneration

A patient with macular degeneration, consisting of white plaques and edema with marked loss of vision, had sudden diminution of vision with marked distortion and macular edema in his other eye. He responded dramatically to dexamethasone, 3.0 mg. daily, for one week. Improvement was reflected in disappearance of distortion and edema, and return of vision to 20/15. Treatment was continued at lower dosage for another two weeks. A similar improvement from 20/80 to 20/30 was obtained in a high myope's only seeing eye. The patient had a history of loss of vision over a period of three months, and had previously been given up as hopeless. It is assumed that macular edema was absorbed in both these cases. Since the underlying pathology is not influenced, the possibility of a future relapse cannot be ruled out. Three other cases with macular changes and edema failed to respond to several weeks of dexamethasone therapy.

Herpes zoster

A case of herpes zoster with keratitis and severe uveitis responded dramatically to dexamethasone in initial doses of 3.0 mg. daily. Systemic treatment was continued for only three weeks. Topical dexamethasone was applied to the eye and skin concomitantly and after cessation of systemic therapy.

Glaucoma

A woman patient with a quiescent chronic uveitis, who developed a wide-angle glaucoma which required filtering surgery, was managed successfully with dexamethasone, 3.0 mg. daily, during the period of surgical treatment.

Central serous retinopathy

Three patients with central serous retinopathy were treated with dexamethasone. Duration of therapy was seven months in one, and four months in another. One of these patients had an excellent response, while the patient who had been under treatment for the longer period of time is, at this writing, only starting to respond. Because of the length of time involved, the question arises whether the response can be attributed to the therapy. The third patient failed to respond.

Disciform keratitis

Two patients with disciform keratitis were treated successfully with dexamethasone. The initial dosage was 3.0 mg. daily. Topical dexamethasone was employed concomitantly.

Summary and Conclusions

1. Sixty-seven patients with a variety of corticosteroid-responsive ocular conditions were treated with dexamethasone. Average initial dosages ranged from 1.5 mg. to 3.0 mg. daily; maintenance dosages were adjusted according to individual requirements.

2. Dexamethasone proved to have the highest milligram activity of any corticosteroid which has been studied to date. Effective dosages are approximately one-tenth those of prednisone, prednisolone, 6-methylprednisolone, or triamcinolone, and one-thirtieth those of cortisone.

3. The only side-effects observed with dexamethasone in this series were edema in varying degrees and four cases of acne; this

is particularly gratifying since, in ophthalmology, one is more likely to elicit side-effects in view of the prolonged treatment at high dosage levels frequently required in chronic intraocular inflammations. There were no gastrointestinal ulcers or other significant gastrointestinal reactions; two patients complained of bloating.

4. Dexamethasone proved to be an effective corticosteroid in the majority of cases. As is true with any steroid, its effect in some patients was no greater than that of previous corticoids, while in others the change to dexamethasone resulted in dramatic improvement. While dexamethasone is not the ultimate adrenocortical steroid, it represents a major step in ocular anti-inflammatory therapy.

5. A large group of patients with various external ocular conditions has been treated with topical forms of dexamethasone. Since the results obtained were similar to those generally seen with prednisone or prednisolone, this series is not discussed in detail.

441 East 68th Street (21).

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OPTIMUM WOUND CLOSURE IN CATARACT SURGERY*

DANIEL M. TAYLOR, M.D.
New Britain, Connecticut

At a recent symposium on diseases and surgery of the lens an effort was made by a panel of experts to determine the ideal number of sutures to be used in cataract wound closure. The answers given by five of this country's outstanding ophthalmologists showed the number to be—from one to five.

The concept of adequate wound closure in cataract surgery thus varies from surgeon to surgeon and, in addition, undoubtedly varies in each patient. In many patients wounds heal without any sutures at all, while in others three corneal-scleral appositional sutures prove insufficient. Since the introduction of the Grieshaber and other micropoint needles all forms of suturing other than direct radial appositional corneal-scleral sutures are now considered obsolete and are gradually falling into disuse.

In attempting to evaluate critically the results of cataract surgery, the final visual result alone can often be misleading. It is more profitable to make the analyses in terms of the frequency of postoperative complications and the degree of anatomic perfection of the healed eye. An eye that has had an uneventful postoperative course and is anatomically perfect will usually have an optimum visual result if the retina is intact.

Therefore, in relation to the problem of wound closure, I believe the incidence of flat chamber, small iris incarceration and hyphema serve as the most useful criteria on which to judge the adequacy of the closure. In terms of anatomic perfection of the healed eye the final astigmatic correction may be used as a yardstick.

* From the Department of Ophthalmology, Yale University College of Medicine and the Ophthalmology Service, New Britain General Hospital. This analysis was made possible by a grant from the Women's Medical Auxiliary of the New Britain General Hospital. Presented at the Manhattan Eye, Ear and Throat Ex-House Surgeons Seminar, April, 1959.

An analysis of this type in my own series of private cataract extractions caused me to question the adequacy of closure with two or three sutures. I believe that other surgeons who employ two or three sutures will arrive at the same conclusion if they subject their own series to a hypercritical analysis rather than simply being satisfied with a good visual result.

After running a comparable series of cases in which additional sutures were used, I concluded that five corneal-scleral sutures provide a much greater margin of safety during the early postoperative period, a marked reduction in early postoperative complications and a considerable reduction in the final astigmatic correction. This concept is by no means new for many outstanding ophthalmologists have used five sutures for years. Routine use of multiple sutures has not gained wide acceptance, however. For this reason I will attempt to demonstrate my reasons for believing that five sutures will some day become accepted as the minimum number for adequate wound closure.

In considering the problem the following points seemed obvious:

1. Immediately after the surgeon applies the dressing in the operating room over a technically perfect aphakic eye he loses control of the eye.

2. In the early postoperative period a certain amount of inadvertent squeezing, coughing, sneezing, straining at stool, vomiting and other undesirable patient reactions are in reality normal phenomena, particularly in apprehensive patients and they cannot be completely avoided through the use of analgesics, sedatives, tranquilizers, cough suppressants, antiemetics, and so forth. In large measure, they reflect the patients' fear and apprehension over the possibility of going blind. Careful instructions and reassurance are quite beneficial with the majority of patients but threats and commands such as "don't squeeze" often have just the opposite effect.

3. Since the surgeon loses control during the immediate postoperative period and undesirable patient reactions are to a large extent unavoidable, any effort to cut down on the incidence of early postoperative complications must come at the time of surgery.

I concluded that the common denominator of all three types of early postoperative complication in my series was clearly that of inadequate wound closure. The eyes had simply not been able to withstand the normal stress and strain of the early postoperative period. I therefore adopted a five- and sometimes six-suture closure for routine cataract extraction. With this simple change in technique, the reduction in the incidence of early postoperative complications directly attributable to wound disruption, slippage or leakage has been dramatic.

My series has now run to 98 consecutive extractions without a flat chamber. There have been no iris prolapses, only one insignificant iris wound synechia, and only one case of hyphema. It has become possible to ambulate elderly patients immediately upon their return from the operating room and, in most instances, feel that discharge from the hospital is safe on the fifth postoperative day.

I have also noticed a marked reduction in the amount of cylinder required at the final aphakic refraction. The degree of astigmatism has often been −0.75D. cyl. or less and not infrequently none at all.

The number of so-called anatomically perfect aphakic eyes has also greatly increased in my series. The anatomically perfect eye is by no means a necessity for a good visual result but is one from which the surgeon derives a great deal of satisfaction. In general an eye of this type usually has a small, well-centered round pupil with an anterior chamber of normal aphakic depth, no iris incarceration, a clear undisturbed vitreous with an unbroken face and an astigmatic error of less than −1.0D. cyl. If the retina is intact, a 20/20 visual result or better will naturally follow.

Case material

In order to analyze the reduction of early postoperative complications and assess the improvement in final anatomic result when five corneal scleral sutures were used instead of two, I selected 100 consecutive cataract extractions performed by me on private patients. Each case represents maximum effort on my part using a uniform technique with the exception of the number of sutures employed.

The first series represents the last 50 cases in which I employed two preplaced McLean-type 6-0 black silk sutures for wound closure and the second series represents the first 50 cases in which I used five sutures consisting of two preplaced McLean type and three postextraction appositional corneal-scleral sutures, either silk or gut.

Technique

1. Oxygen was used under the drapes by a section of rubber tubing connected to an O_2 tank and taped to the patient's chin. This prevents a feeling of suffocation and claustrophobia and makes for a more relaxed patient.

2. Anesthesia was local in all cases and consisted of Van Lint akinesia and retrobulbar anesthesia with Novocaine or Xylocaine mixed with adrenalin and Hydase. The eye was massaged in all cases till soft (I favor the "soft eye technique").

3. A four-mm. limbal-based conjunctival flap was used.

4. A continuous limbal incision was made with a Beaver knife from the 2-o'clock to the 10-o'clock position, approximately one half to two thirds through the thickness of the limbus at a 45-degree angle. An attempt was made to make the incision with one stroke in an effort to avoid a ragged incision sometimes obtained with multiple strokes.

5. In all cases two 6-0 black silk McLean-type sutures were inserted in the groove at the 11- and 1-o'clock positions to insure accurate replacement of the wound margins to their original position. They were placed in the superficial one third of the stroma as deeper suturing may result in an anterior chamber fistula if necrosis occurs about the suture. I prefer silk to gut because there is less necrosis and, in general, less over-all reaction of the eye, although both kinds of suturing material were used in the second series.

6. Incision into the anterior chamber was made with a keratome and more recently with Beaver interchangeable keratome blades. The unusual sharpness of this latter blade plus the fact that the initial incision leaves only one-third to one-half of the stroma unsevered makes this an extremely simple manipulation. The incisions were enlarged to 50 percent of the circumference of the limbus with curved Castroviejo scissors. An effort was made to produce more of a vertical type of incision than a flat one.

7. A peripheral iridotomy at the 12-o'clock position was then done in the majority of cases.

8. The lenses were usually grasped with forceps at the inferior pole and tumbled. The erisophake was employed when the capsule could not be grasped with forceps. An occasional lens was delivered by the sliding technique when the lens seemed to want to come out in this fashion.

9. The McLean sutures were tied and three extra 6-0 black silk or mild chromic corneal-scleral sutures were then placed in the outer one third of the stroma, at the 10-, 12-, and 2-o'clock positions in the second series of patients. They were more easily and accurately placed when the edges of the incision tended to be vertical but slightly inclined as already mentioned. This was probably also a factor in cutting down the incidence of wound slippage. The conjunctiva was closed with a running 6-0 black silk suture.

10. The anterior chambers were restored with an injection of air or saline.

11. Before applying the dressings, all eyes

TABLE 1

COMPARISON OF POSTOPERATIVE COMPLICATIONS AND FINAL DEGREE OF ASTIGMATISM IN 100 CONSECUTIVE CATARACT EXTRACTIONS DIVIDED INTO TWO GROUPS OF 50 ACCORDING TO THE NUMBER OF SUTURES EMPLOYED

Fifty Cases with Two Suture Closure		Fifty Cases with Five Suture Closure	
Immediate surgical complications			
1. Vitreous loss	1		1
2. Capsule rupture	4		6
Early postoperative complications (first week)			
1. Shallow or flat anterior chamber		1. Shallow or flat anterior chamber	
a. Flat chamber	6	a. Flat chamber	0
b. Shallow chamber	4	b. Shallow chamber	0
Total	10	Total	0
2. Iris incarceration and prolapse		2. Iris incarceration and prolapse	
a. Small prolapse	2	a. Small prolapse	0
b. Incarceration or synechias	5	b. Incarceration or synechia	1
Total	7	Total	1
3. Hyphema	4	3. Hyphema	1
Final astigmatic correction			
1. Average	−1.78D. cyl.	1. Average	−0.74D. cyl.

were carefully inspected to make certain that there was no incarceration of iris, vitreous or conjunctiva in the wounds and that the irises were in normal aphakic position with the pupils well centered.

12. Cortisporin ointment was instilled and a monocular dressing was applied.

13. In the cases in which five sutures were employed, the patients were allowed to be out of bed immediately after the operation if they desired and were urged to do so when elderly.

ANALYSIS AND DISCUSSION

In the total of 100 cases I was well satisfied with the technical performance of the operations and in the final appearance of the eyes immediately before allowing the patients to be returned to their rooms.

A small amount of vitreous was lost in two cases—one in each series. In neither case did this disturb the final visual result.

Ten capsules were inadvertently ruptured but this usually occurred late in the delivery and in all but one instance it was possible to convert the end-result into an intracapsular extraction by meticulously picking out the remaining lens capsule and cortex with capsule forceps.

The real and striking difference in the two groups was found in the incidence of flat chambers, iris incarcerations, hyphemas and final astigmatic correction as revealed in Tables 1 and 2.

In the group with only two corneal scleral sutures there were 10 patients out of 50 who had shallow anterior chambers during the first postoperative week. In six of the 10 cases the chambers appeared to be flat or totally absent. In only two of these was air finally injected into the anterior chamber through a paracentesis incision. This was done on the fifth and 10th day, respectively,

TABLE 2

COMPARISON OF THE TWO GROUPS IN TERMS OF THE NUMBER OF CASES PER UNIT OF ASTIGMATISM

Final Cylinder Correction	50 Cases (two suture)	50 Cases (five suture)
0	1	11
−0.25	1	3
−0.50	4	4
−0.75	3	11
−1.00	3	9
−1.25	3	5
−1.50	8	5
−1.75	10	2
−2.00	2	0
−2.25	3	0
−2.50	4	0
−3.50	5	0
−4.00	2	0

and, in both instances, resulted in a cure. The remaining four flat chambers subsided spontaneously on the second, third, fifth and 14th days. None of the entire group of 10 shallow to flat anterior chambers went on to develop glaucoma and as far as I could tell there were no adverse after-effects on the ultimate outcome as a result of these early complications.

Th incidence of iris incarceration was also revealing. Out of the 50 cases with only two McLean sutures there were seven cases in which the iris was caught in the wound. Only two of these were actually prolapses and both were so small that, under ordinary circumstances, neither would have required repair. I did, however, repair one of the prolapses, largely because of a personal desire on my part to produce a perfect anatomic result with minimum chance of late complications (iritis and secondary glaucoma), since the patient was a personal acquaintance. The remaining five incarcerations were quite insignificant and no iris could be seen from external examination of the wound. This did produce some displacement of the pupil in three cases with round pupils. The other two incarcerations were in cases with a full iridectomy and included one of the iris pillars.

In combined extractions, I believe it is more difficult to be certain that the iris pillars are completely free of the wound at the completion of the operation than in the case of a round-pupil extraction where a well-centered round-pupil can easily be visualized and indicates that the wound is free of iris. For this reason the three combined extraction incarcerations may have been partly due to incomplete reposition of the iris at the time of surgery.

The incidence of hyphema may be less revealing but, since it is generally attributed to wound slippage with rupture of bridging capillaries, it would seem to be a necessary factor in determining the adequacy of wound closure.

There were four instances of hyphema in the series with two sutures. Two of these occurred in patients with hemorrhagic retinopathy—one due to diabetes and the other to a combination of diabetes and leukemia. The bleeding in these cases may have been secondary to the hemorrhagic tendency and not to wound slippage.

The third instance occurred in an eye that had extensive atrophic changes of both fundi and questionable light projection. A favorable outcome from surgery was very doubtful but was undertaken as a final measure. The patient did well during the first postoperative week but, after discharge, he developed recurrent hyphema and vitreous hemorrhage with rubeosis irides and detachment of a diffusely degenerated retina.

The fourth case was a typical third-day hyphema that occurred at night and probably reflected wound slippage secondary to trauma.

In sharp contrast to the great multiude of early complications with two sutures the incidence of complications in 50 consecutive cases with five sutures has practically dropped to zero in all categories.

There were no flat or shallow chambers in the second series. All eyes maintained normal aphakic depth. I now have an additional 48 cases without a shallow chamber, making a series of 98 consecutive operations free from this annoying early complication.

There was only one case of iris wound synechia or incarceration and in this one instance I had employed four sutures instead of five. In addition there was only one case of hyphema and it occurred on the third postoperative night.

The final point to be considered is the degree of anatomic perfection of the healed eyes in the two series. The number of eyes presenting an almost untouched appearance was much higher with the five-suture closure technique for there were almost no iris wound incarcerations or synechias to result in distortion or displacement of the pupil.

The average amount of astigmatism in the 50 cases with two-suture closure was −1.78

diopters. The number of cases with a cylinder of −1.0D or less was 12 and the number of cases with −1.75D. or more was 27. Only one case was completely free of astigmatism.

When five-sutures were used for closure, the average cylinder correction was −0.745D. Thirty-eight cases required a −1.0D. cyl. or less. The highest cylinder was −1.75D. and this was needed in two cases. There were 11 cases that were completely free of astigmatism.

This comparison demonstrates a striking reduction in the total amount of astigmatism and in itself is a strong argument for a multiple suture closure.

Summary

The question of what comprises the optimum number of sutures for adequate wound closure in cataract surgery is debatable but in my hands two sutures have, on many occasions, proved inadequate, as revealed by a high incidence of flat chambers, small iris incarcerations, hyphemas, and the magnitude of the final astigmatic correction.

Upon applying the dressing over a technically perfect eye, the surgeon immediately loses control of his patient. Undesirable patient reactions in the early postoperative period, such as squeezing, coughing, vomiting, sneezing, and straining, are in reality quite normal and often unavoidable.

To test the possibility of obtaining greater protection against stress through the utilization of a multiple suture closure, a second series of 50 cases of cataract extraction was performed with identical technique with the exception of employing three postextraction radial appositional corneal-scleral sutures either black silk or gut in addition to two preplaced black silk McLean sutures, making a total of five.

The two series produced about equal visual results but there was a dramatic reduction in the incidence of early postoperative complications and in the final degree of astigmatism in the series with five sutures.

There were no shallow chambers, only one small iris incarceration, and only one hyphema. The final degree of astigmatism was reduced from −1.78D. cyl. in the two-suture series to −0.745D. cyl. in the five-suture series.

In addition in the five-suture series there were 11 eyes without any astigmatism at all and 38 of the 50 eyes had −1.0D. cyl. or less. The highest error was −1.75D. cyl. and occurred in two cases.

Because of the satisfying results I have continued to utilize five sutures and my series now stands at 98 consecutive extractions without a flat chamber. Although the total series is small, I believe it conclusively demonstrates the marked superiority of a multiple suture closure.

It is my belief that five radial appositional corneal-scleral sutures will eventually become accepted as the minimum number of sutures for adequate wound closure in cataract surgery.

32 Grove Hill.

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INTRAOCULAR PENETRATION OF OLEOANDOMYCIN*

GEORGIA A. MCCOY, B.A., AND IRVING H. LEOPOLD, M.D.
Philadelphia, Pennsylvania

INTRODUCTION

Oleoandomycin phosphate is an antibiotic derived from a species of Streptomyces antibioticus. It is a white crystalline compound, the salts of which are water soluble and stable over a 1.1 to 9.0 pH range. Oleoandomycin is able to inhibit most gram-positive bacteria and is effective against several species of gram-negative pathogens. Its spectrum is similar to that of erythromycin.[1] Oleoandomycin may be considered when gram-positive bacteria are encountered which are resistant to other antibiotics. Dumas, Fielding, and Ormsby found that 86 percent of the strains of Staphylococcus aureus they were able to recover from eye culture were sensitive to concentrations of 0.6 μg/cc. and 92 percent of the organisms were sensitive to 20 μg/cc. of oleoandomycin.[2] These authors studied the intraocular pentration of oleoandomycin when applied in a variety of local measures and when given intravenously. They demonstrated that the antibiotic was able to penetrate in high concentration in the aqueous humor by intravenous and subconjunctival injection. The present investigation was undertaken to extend the studies employing a different bioassay technique. Wyeth Laboratories assayed the aqueous, vitreous, and serum specimens using the triple plate diffusion type of assay with Sarcina lutea as the test organism. In most instances, the specimens were refrigerated overnight before being assayed. Essentially the results are in agreement with those reported earlier by Dumas, Fielding, and Ormsby.

TOPICALLY APPLIED OLEOANDOMYCIN

Oleoandomycin solutions in concentrations ranging from one to 10 percent were dropped onto the normal rabbit eye at the rate of three drops every five minutes for 30 minutes—about 0.3 of a cc. total. The eyes were flushed with saline, and the aqueous humor was aspirated 45, 90, and 180 minutes after the initial drop instillations.

Table 1 shows the concentrations obtained in the aqueous humor. A slight reddening of the conjunctiva was noted when five and 10-percent concentrations were employed.

INTRAVENOUS ADMINISTRATION

Fifty mg. of oleoandomycin/kg. was administered intravenously to a group of 12 rabbits with normal eyes. Aqueous humor and blood specimens were obtained in 1, 2, 4, and 6 hours after the intravenous injection. Results are recorded in Table 2.

In a second group of eight animals, 25 mg./kg. were injected intravenously. The results are also recorded in Table 2.

SUBCONJUNCTIVAL ADMINISTRATION

In two groups of six rabbits each, oleoandomycin in concentrations of 1.0 mg./cc. and 2.5 mg./cc. were injected subconjunctivally. The oleoandomycin levels found in

* From the Wills Eye Hospital.

TABLE 1

AQUEOUS HUMOR LEVELS FOLLOWING TOPICALLY APPLIED OLEOANDOMYCIN (AVERAGE OF FOUR EYES)

Concentration	1%	2.5%	5%	10%
Hr.	(μg./cc.)	(μg./cc.)	(μg./cc.)	(μg./cc.)
0.75	1.0	1.7	3.32	39.80
1.5	1.9	3.25	18.50	64.0
3	2.35	2.62	15.20	37.4

the aqueous are recorded in Table 3. Conjunctival swelling and hyperemia were noted following these injections.

ORAL ADMINISTRATION IN RABBITS

In two groups of six normal-eyed rabbits 14.2 mg./kg. and 28.5 mg./kg. of cyclamycin was orally administered. Aqueous, vitreous, and serum specimens were taken at 1, 2, and 4 hours. The results are recorded in Table 4.

Twelve rabbits were given an oral dose of 125 mg./kg. of cyclamycin. In one group of six rabbits, only aqueous humor was aspirated at 1, 2, and 4-hour intervals. In the second group the aqueous, vitreous, and blood levels were taken at the same intervals. These results are recorded in Table 4 also.

In another group of six rabbits 250 mg./kg. were administered orally. Specimens were withdrawn in the same manner as previously and are also recorded in Table 4.

ORAL ADMINISTRATION IN HUMANS

A single oral dose of 1,000 mg. was given preoperatively at 90, 180, and 200 minutes respectively to three male patients labeled A, B, and C. A and B were planned routine cataract extractions, and C was an open-angle glaucoma. Aqueous humor was removed from each eye prior to surgery and blood specimens were obtained simultaneously. In a fourth patient labeled D, two single 500-mg. doses of cyclamycin were given at 13 and 19 hours preoperatively. This was a case of hemangioma of the choroid with a Sturge-Weber syndrome. Aqueous and vitreous humors were removed from the eye 10 minutes after enucleation. Blood specimens were obtained at the same time. The cyclamycin concentrations found in the specimens taken from these patients are recorded in Table 5.

TABLE 2

AQUEOUS HUMOR AND SERUM LEVELS FOLLOWING INTRAVENOUS INJECTIONS OF OLEOANDOMYCIN

	Dose	25 mg./kg.	50 mg./kg.
	Hr.	(μg./cc.; aver. of 4 eyes)	(μg./cc.; aver. of 6 eyes)
Aqueous	1	2.32	3.38
	2	0.78	2.20
	4	0.64	0.95
	6	0	0.60
Serum	1	2.7	5.98
	2	0.84	1.77
	4	0.282	0.795
	6	0.167	0.325

SUMMARY OF RESULTS

It is evident from study of the tables that topically administered oleoandomycin will penetrate through the cornea into the aqueous humor. As might be expected, the higher the concentration employed, the greater the amount which penetrates into the anterior chamber. These results reveal the ready penetration of this agent through the cornea of the normal eye. Concentrations above five percent were somewhat irritating and may in themselves produce staining of the cornea.

Table 2 records results of intravenous administration in the presence of a normal blood-aqueous barrier. As shown earlier by Dumas and coworkers, oleoandomycin when

TABLE 3

AQUEOUS HUMOR LEVELS FOLLOWING SUBCONJUNCTIVALLY ADMINISTERED OLEOANDOMYCIN (AVERAGE OF EIGHT EYES)

Concentration	1 mg./cc.	2.5 mg./cc.
Hr.	(μg./cc.)	(μg./cc.)
1	0.265	0.359
2	0.428	0.785
4	0.093	0.253

TABLE 4

AQUEOUS, VITREOUS AND SERUM LEVELS FOLLOWING ORAL ADMINISTRATION OF CYCLAMYCIN IN RABBITS (AVERAGE OF FOUR EYES)

	Concentration	14.2 mg./kg.	28.5 mg./kg.	125 mg./kg.	250 mg./kg.
	Hr.	(μg./cc.)	(μg./cc.)	(μg./cc.)	(μg./cc.)
Aqueous	1	0	0.19	3.66 and 1.82	11.80
	2	0	0.19	5.04 and 3.95	3.40
	4	0	0	5.60 and 1.61	6.45
Vitreous	1	0	0	1.740	—
	2	0	0	5.04	—
	4	0	0	6.21	—
Serum	1	0.218	0.34	9.600	—
	2	0	0.137	5.46	—
	4	0	0.125	5.26	—

administered as 50 mg./kg. penetrates readily into the anterior chamber. Twenty-five mg./kg. also showed detectable levels in the aqueous. One could anticipate that higher levels could be obtained in the presence of inflammation of the eye. It would appear from these results that oleoandomycin disappears from the aqueous humor at a slower rate than from the bloodstream.

Subconjunctivally administered oleoandomycin also penetrates readily into the aqueous humor to produce theoretically adequate concentrations of this antibiotic in the aqueous humor. These results confirm those reported earlier by Dumas and coworkers. Subconjunctival injections, as with other antibiotics, are quite irritating, producing marked hyperemia, congestion, and swelling which subsided in most of the eyes within 24 to 48 hours following the injection.

The present study, in addition to confirming the earlier work of Dumas and coworkers, demonstrates that orally administered cyclamycin can produce levels which will allow penetration into the aqueous humor and into the vitreous not only in the rabbit eye but also in the human eye. In the rabbit, orally administered cyclamycin (triacetyl oleoandomycin) in concentrations under 14 mg./kg. failed to penetrate into the aqueous

TABLE 5

AQUEOUS, VITREOUS, AND SERUM LEVELS FOLLOWING A 1,000 MG. TOTAL ORAL DOSE OF CYCLAMYCIN ADMINISTERED PREOPERATIVELY

	Diagnosis	Cataract	Cataract	Open-angle Glaucoma	Hemangioma
	Patient	A	B	C	D
Aqueous	Time				
	90 min.	N.A. at 1 to 4 dil.			
	180 min.		0.863 μg./cc.		
	200 min.			N.A. at 1 to 4 dil.	
	13 and 19 hr.				1.20 μg./cc.
Vitreous	90 min.	—			
	180 min.		—		
	200 min.			—	
	13 and 19 hr.				1.74 μg./cc.
Serum	90 min.	2.43 μg./cc.			
	180 min.		39.60 μg./cc.		
	200 min.			0.11 μg./cc.	
	13 and 19 hr.				1.476 μg./cc.

and vitreous although serum levels could be detected. When the dosage was doubled to 28.5 mg./kg., levels were obtained in the aqueous and definitely in the serum, but not in the vitreous. It had been shown by Esselier and Keith that this drug does penetrate from the gastrointestinal tract into the bloodstream, which is confirmed by these studies. Higher aqueous humor levels can be obtained by increasing the oral dose as demonstrated in the results recorded in Table 4. Values were obtained in the vitreous humor as well as in the aqueous when 125 mg./kg. were administered.

The data obtained in humans revealed that serum levels can be obtained, and that the drug can penetrate into the aqueous humor 180 minutes after oral administration, as demonstrated in cataract patient B, but that this did not always occur. Penetration in the fourth patient studied was greater than in the others. Oleoandomycin was revealed not only in the aqueous but also in the vitreous although it could not be recovered from the vitreous of the other three patients. However, the patient had a hemangioma, and one would anticipate that this might have increased the amount of drug available to the vitreous humor and not be comparable to values which might be anticipated to be obtained in normal eyes.

The study confirms the potential value of oleoandomycin for use in ocular infections which are due to gram-positive organisms that are sensitive to oleoandomycin. The drug should be used in massive doses when orally administered in a range of 125 mg./kg. for a priming dose. Studies in the experimental animal eye reveal that after such a large oral dose levels will persist for at least four hours, probably six to eight hours, so that repeated doses can be smaller, and perhaps given every six to eight hours after the initial large dose.

Conclusions

1. Oleoandomycin will penetrate into the aqueous humor when topically applied in concentrations below 10-percent solutions.

2. Subconjunctivally and intravenously administered oleoandomycin will produce blood levels which will allow penetration across the blood-aqueous barrier of the normal rabbit eye.

3. Orally administered cyclamycin in large doses will allow penetration into the aqueous and vitreous humor of the normal rabbit eye and into the aqueous humor in human eyes with no other evident pathology than glaucoma and cataracts.

1601 Spring Garden Street (30).

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NOTES, CASES, INSTRUMENTS

MANDIBULOFACIAL DYSOSTOSIS

R. P. THOMAS, M.D.
Winston-Salem, North Carolina

Several recent case reports of mandibulofacial dysostosis,[1–3] in the American literature indicate renewed interest in this syndrome. The case to be presented represents a transitional form between mandibulofacial dysostosis and craniofacial dysostosis.

The first reported case of mandibulofacial dysostosis is ascribed to Berry,[4] in 1889, followed in 1900 by the report by Treacher Collins[5] of the incomplete syndrome. Scattered reports subsequently appeared but it remained for Franceschetti[6,7] and his group to delineate and define the syndrome in 1944 and 1949. The condition is also known by a confusing variety of eponyms (Collins-Franceschetti-Zwahlen syndrome, Franceschetti syndrome, and other combinations).

The complete syndrome consists of the following features (modified from Franceschetti and Klein[7]):

1. Antimongoloid slant of the palpebral fissure.
2. Notching (coloboma) of the lower lids.
3. Hypoplasia of the facial bones, especially the zygoma and the mandible.
4. Malformations of the external, middle, and inner ear.
5. Macrostromia, high palate, and malocclusion of the teeth.
6. Blind fistulas (dimples) between the angles of the mouth and ears.
7. Atypical tongue-shaped processes of the hair line extending toward the cheeks.
8. Other anomalies, especially skeletal deformities.

As with any syndrome, one or more features can be, and usually are, absent in any given case. The scarcity of reports on this condition attests to its rarity. The forme fruste may be indicated by notching of the lower lids, minimal hypoplasia of the facial bones or possibly by deformities of the ears. These minimal signs may be more common than suspected.

That the syndrome is usually governed by an irregular dominant gene with variable expression is well documented. A number of cases, reported without family histories, may indicate mutations, or the operation of some environmental factor as yet unidentified. A search for possible environmental factors acting during the first trimester of pregnancy is worth while.

Mann[8] attributes the defects to retarded differentiation of maxillary mesoderm involving the first visceral arch, occurring about the seventh fetal week. The notching of the lower lid is thought to represent the junction of paraxial and visceral mesoderm. This is thought to correspond to the junction of the area supplied by the first division of the trigeminal nerve with that area supplied by the second division. Little new material has been added to this classic description.

Although usually grouped with the craniostenoses, premature cranial synostosis is unusual. Oligophrenia associated with the syndrome has been noted, but appears to be the exception rather than the rule, in contrast to the true craniostenoses. It is speculative whether oligophrenia, when present, represents a developmental arrest or is secondarily a result of increased intracranial pressure. The latter is thought to be the usual cause of oligophrenia in the true craniostenoses. Odd-shaped skulls have been frequently associated with the syndrome, suggesting aberrant growth at the cranial sutures.

Vogt decried the idea of a separate name for every new combination of signs, and Howell[9] re-emphasized this concept in his excellent review of the true craniostenoses. This viewpoint stresses the similarities of related syndromes rather than somewhat arbitrary and often ill-defined distinctions.

The interest of my case lies in the pres-

Fig. 1 (Thomas). Front view of patient.

Fig. 2 (Thomas). Side view of patient.

ence of several features usually associated with the true craniostenoses, and in particular with cranial-facial dysostosis (Crouzon's disease). These features are: (1) divergence of the orbital axes with resultant divergent squint, (2) shallow appearing orbits, and (3) apparent exophthalmos, in addition to features of mandibulofacial dysostosis. Straith[10] previously described a case of mandibulofacial dysostosis with divergent strabismus. Divergence of the orbital axes is usually ascribed to lack of development of the greater wing of the sphenoid, which in normal development pushes the laterally directed fetal orbit to the forward directed adult position.

Case report

An 18-month-old girl was brought to the eye clinic for evaluation of a divergent strabismus. The infant was full-term. Birth weight, nine pounds, 11 ounces. The pregnancy was uneventful and no history of prenatal trauma or infections was elicited. The infant was noted to have a stridor during the neonatal period and has suffered recurrent upper respiratory infections. Examination of the mother and six siblings disclosed no visible or palpable stigmas of the syndrome. The father and three other siblings were said to be normal.

Physical examination revealed a well-nourished, alert white girl with odd facial features (figs. 1 and 2).

There was an antimongoloid slant of the palpebral fissures. A slight notch was noted in the lower lids approximately three mm. from the outer canthus bilaterally. The inner portion of the lower lid appeared atrophic with a deficiency of lashes. There was a widely divergent strabismus, appearing to be the result of the divergent orbital axes. No individual muscle paralysis was elicited. The orbits appeared shallow, especially the right, and there was an apparent exophthalmos. Visual acuity appeared to be normal and the patient could alternate but preferred to use the left eye. The fundi appeared normal and no abnormalties of the disc were noted.

The pinnae of the ears were small, thickened and malformed. The external auditory meatus was absent on the right and stenotic on the left.

There was a palpable defect in the zygomatic arch, bilaterally, inferolateral to the orbits. The lower jaw was recessive, and there was a high arched palate. Prominent frontal bossing was noted. Deep dimples appeared on the cheeks with certain facial expressions. The birth record noted sinuses above each ear, but these have subsequently disappeared. The remainder of the physical examination was normal.

Radiologic examination demonstrated a fairly large defect in the zygomatic arch bilaterally and the body of the mandible was somewhat small.

North Carolina Baptist Hospitals Inc.

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MODIFICATION OF AN OPHTHALMOSCOPE*

For diagnosis of fixation behavior

Gunter K. von Noorden, M.D.
Iowa City, Iowa

The exact diagnosis of the fixation behavior in strabismic amblyopia is mandatory before treatment is initiated. This is important no matter whether one uses pleoptic methods or occlusion treatment alone. It has been pointed out[1-3] that the conventional method of simple observation of the corneal light reflex on attempted monocular fixation is not a sufficiently accurate method to diagnose small fixation anomalies, such as parafoveal or paramacular fixation.

Two methods have been used by us in the past, allowing a more exact determination of the fixation behavior. Fixation photography[4] is one method, but this method is generally confined to larger eye clinics where a fundus camera is available. The second instrumentation was introduced by Cüppers[2] who developed the visuscope, a special ophthalmoscope with an asterisk inserted in the pathway of the light. The image of the asterisk is seen by the examiner on the fundus while the patient is invited to fixate the target. The mode of fixation can thus be readily recognized.

The visuscope, however, may not be available in every office and, for exact and quick diagnosis of the fixation behavior, we have found a simple modification of the ordinary ophthalmoscope to be of excellent clinical value. This modification was described by Bangerter[1] and can be readily applied to conventional ophthalmoscopes by any skillful optician.

Using a 1/4000 inch pivot watchmaker's drill, held with a pin vise, the interchangeable green filter of an ophthalmoscope is perforated in its center. A small bright dot in the center of the illuminated green field becomes visible to the patient, who is asked to fixate this target. The foveal reflex will be seen by the examiner within the brighter area when central fixation is present. Other retinal areas will appear in the center of the illuminated field in cases of nonfoveal fixation.

Care must be taken to reduce the brightness of the ophthalmoscope to some degree during the examination in order to maintain sufficient contrast between the darker surrounding and the brighter center, and thus provide an adequate fixation stimulus.

The technique of perforating the filter was suggested and carried out by Mr. Kenneth Hansen of the Iowa City Optic Company.

University Hospitals

* From the Department of Ophthalmology, State University of Iowa Medical School.

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FORCEPS-IRRIGATOR

For cataract surgery and other operations in the anterior chamber

S. Adler, D.O.M.S.
Johannesburg, South Africa

In 1954,* I described a "forceps irrigator" to irrigate the anterior chamber and to prevent its collapse while allowing manipulations within it.

Since then the forceps portion, while retaining its essential simplicity, has been redesigned to afford greater delicacy, and a "scissors-irrigator" has been made on the same principle.

Briefly, the apparatus used (fig. 1) consists of a delicate forceps (fig. 2) or scissors (fig. 3), one blade of which is canalized to allow an accurately controlled flow of sterile saline from a vacolitre. The apparatus permits irrigation and manipulation with either the forceps or the scissors in a fluid-filled cavity despite the loss of aqueous.

The scissors-irrigator and the forceps-irrigator are easily interchangeable and are readily attached to the vacolitre tubing by means of a record syringe type of adaptor. As the anterior chamber is kept filled with fluid, there is very little danger of injury to the iris or to the corneal endothelium. Infection is reduced to a minimum, if not entirely eliminated, by the use of sterile bland fluid delivered from the vacolitre without an intermediate receptacle.

The flow of saline can be finely adjusted by means of a stopcock before either instrument is inserted into the anterior chamber, thus insuring that the irrigation is not too forceful, and allowing the surgeon to devote his entire attention to the technical details of the operation.

A few remarks follow on its advantages in cataract surgery and other procedures in the anterior chamber.

Extracapsular cataract extraction

After the removal of a large portion of the anterior capsule with an extracapsular toothed forceps, the lens nucleus is removed. Using the forceps-irrigator, any visible capsular or soft lens matter can be removed with a wide margin of safety. (If desirable and expedient, the entire capsule can be avulsed and removed with the forceps-irrigator.)

The safety of the procedure is enhanced by partly closing the incision with one or more corneoscleral sutures before inserting

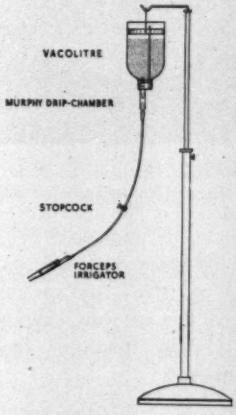

Fig. 1 (Adler). Schematic drawing of irrigator.

* Adler, S.: South African M. J., **28**:61, 1954.

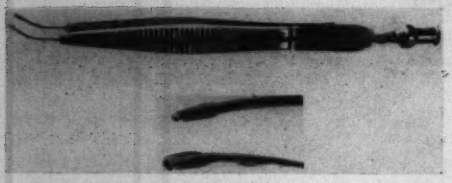

Fig. 2 (Adler). Forceps-irrigator. Inset shows enlargement of gripping portion with outlet of canalized blade.

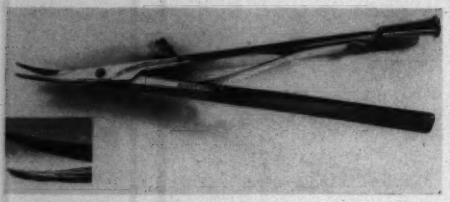

Fig. 3 (Adler). Scissors-irrigator. Inset shows enlargement of cutting portion with outlet of canalized blade.

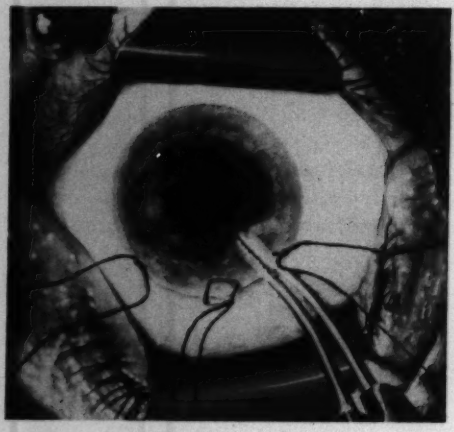

Fig. 4 (Adler). Diagram to illustrate forceps-irrigator in the anterior chamber, with the incision loosely closed.

the special irrigator (fig. 4.), as this limits the leakage of fluid and permits suitable distention of the anterior chamber. This is advisable if more than one fourth of the limbus is incised.

Other indications

The instrument has been found highly satisfactory for the removal of clotted or fluid blood, soft lens matter (in linear extractions), or foreign bodies, especially of the nonmagnetic variety, as well as for the breaking down of anterior or posterior synechias.

Over the past nine years, I have found it consistently safe and helpful in facilitating operations within the anterior chamber. In difficult cases, it has proved of inestimable value.

Osler Chambers,
Jeppe Street.

My thanks are due to Mr. Sean Lynch for his illustrations and to Mr. R. Klomfass of the Medical School, Johannesburg, for his co-operation and ready assistance in the making of the original forceps. These instruments are obtainable from: C. W. Dixey & Son, 19 Wigmore Street, London W.1.

A LENS*

To transpose cylinders in a refractor unit

Otto H. Jungschaffer, M.D.
Boston, Massachusetts

There are two principal types of refractor units, those with minus cylinders and those with plus cylinders. A unit which contains both plus and minus cylinders is not commercially available in the United States. If one desires one kind of refractor, it seems as though only the other is immediately available. It is true that a minus cylinder instrument can be used with plus cylinder technique. This method requires thinking in terms of plus cylinders, setting the minus cylinder, changing the axis of the minus cylinder 90 degrees and producing the plus cylinder effect with the sphere. If all this thinking and all these manipulations are done correctly, the minus cylinder is "automatically" transposed into a plus cylinder.

A cylinder neutralizes another cylinder of equal power but of the opposite sign if their

*From the Massachusetts Eye and Ear Infirmary.

axes are parallel. Applying this fact, in 1956, I had Parson's Optical Company of San Francisco put a pair of plus 2.50 diopter cylinders in the housings for supplementary lenses which were originally supplied with the instrument. These placed into my refractor, neutralized the minus 2.50 diopter cylinder. I have found minus cylinders objectionable since I was accustomed to working with plus cylinders.

Whenever it is desired to use plus cylinders with a minus cylinder instrument, the procedure is begun by inserting the plus cylinder, thereby neutralizing the highest minus cylinder of the refractor. This plus cylinder remains in place throughout the examination. The control for the cylindrical power is set at the highest minus value thus obtaining the power of zero.

The control for the spherical lens power is operated in the usual way. The sphere is the same as indicated on the instrument. The minus cylinders of the instrument are decreased, thus obtaining plus cylinder power.

The value of the cylinder obtained in this way is the algebraic sum of the power of the auxiliary cylinder and the minus cylinder of the instrument. For example, an inserted plus 2.50 cylinder and an indicated minus 2.0 cylinder is a plus 0.50 cylinder. The cylinder axis is the same as indicated on the protractor around the sight-aperture. Cylinders between plus 2.50 and plus 5.0 diopters are obtained with a plus 5.0 cylinder auxiliary lens, on an instrument which has a cylindrical power up to minus 2.50. On an instrument with incorporated cylinders from zero to 6.0 diopters, cylindrical powers from minus 6.0 to plus 6.0 diopters, can be obtained with an auxiliary cylinder lens of 6.0 diopters.

Minus cylinder auxiliary lenses are used to adapt a refractor with plus cylinders and plus cylinder auxiliary lenses are used to adapt a refractor with minus cylinders. This well-known principle, though not generally thought of, is thus applied.

It should be possible to obtain the desired lenses from the optical company which supplied the refractor.* However, if these are not available, one can use the housings of a pair of supplementary lenses to make the change. Any major optical shop should be able to put the cylinder lens into the housing with the axis in such a position that it coincides with the cylinder axis indicator on the unit. The power of the auxiliary cylinder should be printed on it in the conventional color (white for plus, red for minus) sufficiently large and clear to be read in the sometimes employed, comparative dim illumination of the examination room.

In this way any refractor can be used with minus and/or plus cylinders. For retinoscopy and in particular streak-retinoscopy, the use of plus cylinders is preferable.[1,2] The estimation and determination of the amount and axis of the cylindric error is facilitated where the axis of the employed plus cylinder coincides with the indicator line on the protractor. For the refraction with the Lancaster-Regan dials, minus cylinders are used.[3] With this versatile refractor-unit a patient can be examined with one of the best objective methods, streak retinoscopy; followed by one of the best subjective methods, the fogging technique, just by inserting a lens. The different refraction methods could be reconciled. A refractionist could try the opposite of his accustomed cylinder with the same instrument and perhaps find some advantage in it. No secondary effects of the additional cylinder nor any appreciable size changes of the image are encountered since the surfaces of the lenses are in close apposition and their optic and geometric centers remain on the optic axis.

Summary

A simple method is presented for convenient conversion of any refractor unit into a minus or plus cylinder instrument merely by the addition of a pair of auxiliary cylindrical lenses.

243 Charles Street (14).

* The supplementary lenses described in this paper can be obtained from the Bausch & Lomb Optical Company, Rochester 2, New York.

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A SUTURE SPREADER*

FOR USE WITH PREPLACED CORNEOSCLERAL CATGUT SUTURES IN CATARACT SURGERY

ROBERT N. LEHMAN, M.D.,
AND
MURRAY F. MCCASLIN, M.D.
Pittsburgh, Pennsylvania

Corneoscleral 6-0 catgut sutures as used in cataract surgery are hard to see because of their size and hard to handle because of their obstinate stiffness. A suture spreader made from a large-sized safety pin (fig. 1) can be helpful in overcoming the latter, especially if preplaced sutures are employed. This instrument can be placed after the corneoscleral sutures are inserted and it will then separate the arms of the catgut so that a keratome or the blades of a corneal scissors can be placed between them to make the section without cutting off the sutures (fig. 2).

If a single suture is used, such as a McLean, a single straight spreader can be used at the 12-o'clock position. If multiple corneoscleral sutures are used, a curved suture spreader is preferred, the curve being necessary to conform to the smaller space between nose and medial suture. The curve is employed in the opposite direction for sutures on the temporal side (fig. 3).

After completion of the section, the suture spreaders may be quickly removed by pinching together the two arms and sliding the hooks out through the suture loop. The surgical procedure may then be completed in the usual manner.

*From the Veterans Administration Hospital, and the University of Pittsburgh School of Medicine.

This suture spreader was made by cutting off one end of a two-inch rustproof safety pin with tin shears, smoothing the cut ends with a file, and bending these ends to form hooks. This instrument is light in weight and may

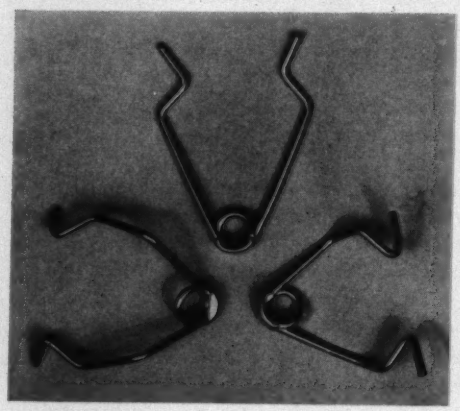

Fig. 1 (Lehman and McCaslin). A suture spreader made from a large-sized safety pin.

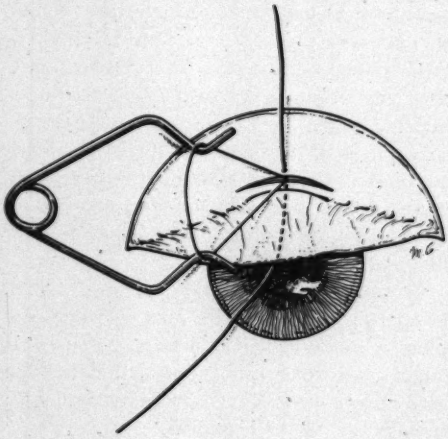

Fig. 2 (Lehman and McCaslin). Demonstrating use of spreader.

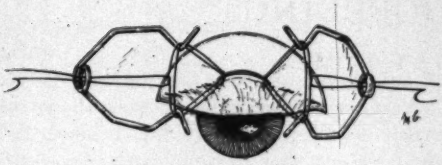

Fig. 3 (Lehman and McCaslin). Spreader with a curve.

be permitted to rest on the eye without causing damage. It may be sterilized by any method.

University Drive (40).

A CORNEAL DISSECTOR

For lamellar keratoplasty and anterior or posterior lamellar keratectomy

Geminiano de Ocampo, M.D.
Manila, Philippines

The de Ocampo corneal dissector* (figs. 1 and 2) is designed to split stromal lamellae at their cleavage planes and also to cut the many minute interconnections between lamellae of different layers. The angle of the handle to the blade when flat is 120 degrees to facilitate a slicing stroke on both sides. The double-edged blade is slightly curved to correpond to the curvature of the cornea. It is about 7.0 mm. long and 1.5 mm. wide at its center. Its anterior and posterior surfaces are slightly convex while its point is sharp but not very pointed. Its edges on both sides are symmetrical and slightly curved outward from the point to the base and while they can cut, they are not as sharp as a cutting knife.

Exactly the same method is followed in getting the graft as in excising the diseased cornea. The corneal dissection is combined cutting and splitting, by slicing-withdrawing movement. After marking the size, the place, and, as closely as possible, the depth of the lamella to be dissected in the donor or host eye, by the aid of the trephine in most cases, the cleavage plane is determined and even slightly enlarged by the dissector with the under surface of the blade.

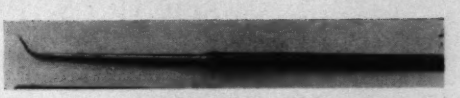

Fig. 1 (de Ocampo). Side view of dissector.

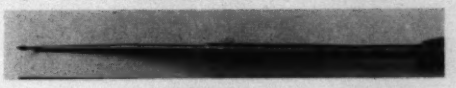

Fig. 2 (de Ocampo). Front view of dissector.

A traction suture is placed at the edge and the cleavage plane becomes visible. This can be deepened and changed when necessary, under direct visualization, by the Bard-Parker knife, which is utilized to start the dissection, more accurately with the aid of the operation microscope.

While the traction suture stretches the anterior lamella, the corneal dissector is used to continue and complete the splitting to one mm. outside the mark previously made by the trephine or the area to be resected. The edges are then cut completely by the Katzin scissors or (especially in the donor eye) by reapplying the trephine. In lamellar keratoplasty, the graft will exactly fit the bed in the diseased host cornea. In anterior lamellar keratectomy, the surface of the posterior remaining cornea will be smooth. In posterior lamellar keratectomy, the posterior lamella to be excised can be exposed by lifting up the anterior lamella whose under surface will also be smooth.

Even when there occurs a perforation of the posterior lamella, dissection by this instrument and method can be completed. Dissection is much easier in the donor eye or in a diseased cornea that is not too fibrous. When the leukoma is too dense, the regular cleavage planes may not be present and the cutting edge of the dissector may not be sharp enough. In such cases the Bard-Parker knife may be utilized. When some leukoma remains in the posterior layer of the cornea, another lamella may be removed by the dissector, following the same technique.

932 Isaac Peral.

* Made by Storz and Company, Saint Louis, Missouri.

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

MEMPHIS EYE, EAR, NOSE AND THROAT SOCIETY

OPERATION FOR DIVERGENCE PARALYSIS

DR. J. WESLEY MCKINNEY reported the case of Mrs. W. S. S., aged 24 years, who was first seen for examination on February 5, 1954. She stated that in early childhood her eyes had crossed but had later straightened out. During pregnancy, a little more than a year previously, the eyes had again crossed and had seemed to get worse instead of better. She had worn glasses since the age of three years and most of the time the glasses had been bifocals. She had diplopia most of the time for distance. She had taken exercises without benefit.

Examination revealed a possible slight limitation of external rotation of each eye. Fixation was with either eye, with some preference for the left. In the midline there was homonymous diplopia beyond four feet, increasing as the light or object was moved away. Within four feet there was good fusion and stereopsis. Cover test showed esotropia for distance and orthophoria for near. The diplopia was the same in all fields. At one meter the Lancaster diplopia field showed a homonymous diplopia of 23 prism diopters and the separation of images was approximately equal in all fields. The eyes were grossly convergent when the patient looked in the distance. A complete neurologic study was carried out and all findings were negative.

These findings, together with the history of convergent strabismus, and the absence of other neurologic findings, indicated a probable congenital basis for the divergence paralysis.

On March 2, 1954, a five-mm. resection of each external rectus muscle was done. The postoperative course was uneventful, and the diplopia was completely relieved.

Maddox rod measurment now shows 14 prism diopters esophoria for distance and eight prisms diopters exophoria for near. There is, however, no deviation to cover for distance and slight exophoria for near. Worth four-dot test shows good fusion for distance and there is good fusion and stereopsis for near.

PRECANCEROUS MELANOSIS

DR. ALICE R. DEUTSCH reported the case of Mr. H. P., aged 75 years. He was seen for the first time in February, 1958. He had no special complaints but wanted his eyes examined as he had lost his glasses. The examination revealed some lens and pronounced vascular changes of the fundi, which is compatible with the patient's age. The vision equalled: O.D., +3.25D. sph. ⊃ +1.0D. cyl. ax. 145°, 20/40; O.S. +3.25D. sph. ⊃ +1.0D. cyl. ax. 180°, 2/40. The intraocular pressure was 17.3 mm. Hg. in both eyes.

The only unusual finding was the appearance of the left eye. A dense smooth pigmentation surrounded the limbal area from the 12:30 to the 7-o'clock position with an average diameter of three mm.; two tongues of pigmentation were visible in the cornea immediately in front of Bowman's zone; the larger of those projections started at the 5-o'clock position and reached the corneal center. The corneal surface was unchanged. Plaques of granular pigmentation and pigmented dots occupied the temporal half of the bulbar conjunctiva, reaching toward the fornices and the temporal lid-angle, respectively. Two stripes of atrophic conjunctiva were visible in the lower temporal quadrant. No real tumefactions were present but one small place at the 2-o'clock position, close to the limbus, seemed to be more elevated. Several enlarged vessels were quite apparent and around them the conjunctiva was thickened like that in chronic inflamma-

tory reactions but without loss of normal luster.

The patient gave the information that he was not aware of the pigmentation himself but that it had been mentioned to him during his last two or three eye examinations and referred to as "nevus" or "freckles." He noticed, however, that during the last two or three years his left eye had been inflamed several times but that the inflammation had subsided mostly by itself in several weeks. One time a prescription for drops had been given to him.

The clinical picture described does not resemble any kind of congenital melanosis or a nevus; even a flat diffuse nevus is somewhat elevated and also mostly includes microcysts. This case undoubtedly belongs to the group of acquired melanoses. The diffuseness of the pigmentation, their superficial locations, and the striae of atrophic mucosa could well be interpreted as signs of precancerous melanosis. The presence of inflammatory reactions and enlarged vessels might even suggest a change toward the malignant phase.

Reese (Am. J. Ophth., 39:96 [Apr.] 1955) reported successes with irradiation in in his series of precancerous melanosis. He also asserts that the prognosis would not be jeopardized by an excision for biopsy. On the other hand he maintains that the pathologic diagnosis is often just as difficult as the clinical. In view of the known slow progress of the disease and the age of the patient, the question arises whether or not it would be best to do nothing in this case—even in view of the potentially poor prognosis.

Eugene A. Vaccaro,
Secretary, Eye Section.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM

THE 79th annual congress was held in London, at the Royal Society of Medicine, on April 9 to 11, 1959. Over 300 members and their guests attended, including several distinguished foreign visitors. Mr. R. C. DAVENPORT, president of the society, was in the chair. In his presidential address on glaucoma he considered the relationship between myopia and glaucoma, recalling that association of the two conditions was not as rare as was often supposed, and he discussed the connection between glaucoma and obliterative arterial disease and its possible etiologic significance.

SWOLLEN OPTIC DISC

Mr. DESMOND GREAVES emphasized the need to recognize the wide limits of normal and congenital anomalies of the optic disc and to distinguish them from early pathologic changes. He discussed the vascular arrangement at the nervehead, and the absence of any considerable connection between the central artery of the optic nerve and the circle of Zinn on the one hand and the central retinal artery on the other. The relationship between the degree of swelling of the optic disc and the loss of function gave much help in diagnosis. In the discussion all agreed that papilledema was an unsatisfactory term, especially for universal application to the swollen optic disc, but its use was so well established that attempts to abolish it were probably unrealistic.

Dr. S. P. MEADOWS said that raised intracranial pressure could not be ruled out merely because the optic nerve was not swollen. The degree of swelling varied even in cases of cerebellar tumor, which are particularly prone to early papilledema. An unusal picture which Dr. Meadows showed was of papilledema and retinal hemorrhages in a patient with emphysema.

Mr. CHARLES COOK illustrated the histologic changes in the swollen disc and showed how the retina in the immediate neighborhood was shallowly detached. The course taken by the optic nerve fibers in papilledema, and the importance of the cul-de-sac of the subarachnoid space, were both demonstrated.

Treatment of ocular injuries

Mr. John Whitwell felt that the treatment of nonperforating injuries was almost as dull as refractions. He found little to choose between sulfacetamide (Albucid) and Polyfax (containing polymyxin B and bacitracin) as a routine ointment after the removal of corneal foreign bodies—the commonest of all injuries. Rust rings should be removed early. He pleaded for the admission of all cases of traumatic hyphema, and for proper rest for all cases of considerable trauma, particularly in view of the danger of secondary hemorrhage and glaucoma, which was very hard to treat and might lead to loss of useful vision or even of the eye. When glaucoma did ensue, the operation of choice was cyclodiathermy. Subconjunctival papaverine was suggested as a treatment for commotio retinae. It was important to search the retina for tears even in the absence of retinal detachment.

Mr. M. J. Roper-Hall, dealing with perforating wounds, said that recent improvements in the treatment of those wounds without retained foreign bodies was probably due to the meticulous suturing of the corneoscleral wounds, and the injection of air into the anterior chamber. Injection of air not only checked that the suture line was water (or air) tight but also discouraged anterior synechias. Conjunctival flaps had been almost abandoned. He recommended the use of magnification so that the surgeon could really see what he was doing—even for those surgeons who were not yet so presbyopic as to need reading glasses. Reposition of prolapsed iris, in very recent injuries, seemed to be justified in some cases. Mr. Roper-Hall felt that there was not so much hurry to remove intraocular foreign bodies that accurate localization could be overlooked. It was better to wait if adequate X-ray or theater facilities were not immediately available. He favored the Mellinger-type magnet, especially for removal by the posterior route, which was usually the best method, unless the lens was much damaged already. Diathermy was not necessary to stop detachments after posterior removal, for the passage of the foreign body set up enough choroiditis to do that, but diathermy might reduce the risk of vitreous hemorrhage. With nonmagnetic foreign bodies it was justifiable to wait a week or two to gauge the strength of the ocular reaction since removal of these objects was likely to be very traumatic.

Mr. Giles Romanes based his paper on the treatment of eye burns on cases treated at East Grinstead. When lid tissue had been lost, immediate action was necessary to cover the cornea, and he discussed the use of a bipedicle conjunctival flap and other possible methods. In chemical burns immediate and prolonged irrigation was the main essential.

Treatment of retinal detachment

In the Bowman lecture Prof. Louis Paufique (Lyons) surveyed the history of detachment surgery since the days of his youth, before Gonin had performed his first successful operation. He recalled that even in 1929 Prof. Gayet had declared that "to wish to treat a retinal detachment one must be either a charlatan or a fool."

Prof. Paufique described the crude results with Gonin's thermocautery, then Weve's introduction of diathermy and his method of localizing the retinal tears by transillumination. Then in 1950 came the operation of lamellar scleral resection to replace the more dangerous and difficult full-thickness resection of Müller and Lindner. Lamellar resection was elaborated, particularly by Shapland in England and Paufique himself in France, till it was now the operation of choice in about half the cases. Finally, Prof. Paufique dwelt in some detail on the latest advances of vitreous transplanation (using powdered lyophilized vitreous) and light-coagulation. Evaluating his latest 524 cases, Prof. Paufique recorded a 70 percent success-rate (a figure corresponding to most other recent assessments). Of the failures, in 15 percent the nature of the detachment could be said

almost to have precluded a cure, but it was hard to explain why the other 15 percent failed.

Some other subjects

Dr. Eric Linner (Göteborg, Sweden) assessed the rate of aqueous flow in disordered adrenal function, when the usual decrease at night was found to be significantly less.

Mr. A. G. Cross described some cases of successful treatment of persistent vernal catarrh by the inlay of buccal mucous membrane.

Mr. W. E. S. Bain described results with the recording tonometer recently introduced by Maurice, which allows the subject to move freely while wearing it.

Mr. L. G. Fison illustrated the difficulties in differential diagnosis of secondary retinal detachments, and the advantages of binocular ophthalmoscopy.

Mr. P. D. Trevor-Roper considered the evolution of visual artistry, attempting to bridge the gap that separates the nonrepresentational "art" of birds and primates from the representational art of primitive man, in the light of the developmental stages of child art, near-blind painting, and blind sculpture.

Mr. F. C. Rodger described an investigation into the effect of citral and vitamin A on glaucoma, which had yielded rather indefinite results.

The Lancet
May 2, 1959, p. 919.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

December 1, 1958

Harvey E. Thorpe, M.D., *President*

Management of congenital glaucoma

Dr. Harold G. Scheie (Philadelphia) in presenting the 12th annual Schoenberg Memorial Lecture pointed out that congenital glaucoma is important because it causes considerable blindness which is preventable. Early diagnosis is important for preserving vision. An important early sign is photophobia; pediatricians should be on the alert that this is often the presenting symptom. Glaucoma should be suspected until it is ruled out.

The other classical signs point to the need for careful tonometry under deep general anesthesia, repeated if equivocal. Corneal haze and increase in size are late signs. Gonioscopy does not aid the diagnosis.

The condition may be confused with megalocornea, high myopia, and idiopathic corneal opacity (? incomplete Hurler's disease). Congenital glaucoma is often associated with other congenital defects.

No medical treatment is effective. The operation of choice is goniotomy with or without goniopuncture, without operative gonioscopy; goniopuncture is especially effective in older cases or older patients.

In the postoperative management, (1) if tension is not relieved, reoperate in six weeks; (2) follow every three months for a year, then yearly; (3) complications include atrophy of the iris, hemorrhage, infection.

The combined operation is effective in about 85 percent of cases.

Alan Barnert,
Corresponding Secretary.

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EDITORIAL STAFF

DERRICK VAIL, *Editor-in-Chief*
700 North Michigan Avenue, Chicago 11

ALAN C. WOODS, *Consulting Editor*
Johns Hopkins Hospital, Baltimore 5

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THE CULTIVATION OF TRACHOMA VIRUS

The cultivation of trachoma virus in series and quantity has only recently been achieved (T'ang, Chang, Huang, and Wang: Chin. M. J., 75:429, 1957; Collier and Sowa: Lancet, 1:993, 1958). For years, however, the literature has been replete with reports of cultivation. These were reviewed by the Expert Committee on Trachoma of the World Health Organization whose second report (1956) contains the following statement: "The Committee recognizes the importance of the now numerous claims for temporary cultivation of *C. trachomatis* in tissue culture and in the yolk sac and chorioallantois of the developing chick embryo, but is not convinced that, at the time of writing, cultivation in series or in quantity has been accomplished."

In a report to the International Organization Against Trachoma in Brussels in 1958, Thygeson and Nataf (Revue Intern. Tra-

chome, 2:83, 1958) attempted an evaluation of these claims. They concluded that many of them were probably in error, cultivation having been presumed on morphologic grounds alone; that others probably represented temporary persistence or limited multiplication of virus not transmissible in series; and that the reports of transmissions of trachoma virus to mouse brain, mouse lung, and other tissues required confirmation.

The multiplicity of these incompletely substantiated claims prompted the World Health Organization Committee to suggest the following criteria for the acceptance of a given virus under cultivation as the cause of trachoma: (1) That Halberstaedter-Prowazek inclusion bodies be demonstrated in serial cultures; (2) that experimental trachoma capable of transmission in series be produced in monkeys or apes; (3) that a serologic relationship between the cultured virus and trachoma be demonstrated; and (4) that trachoma be produced in human volunteers after sufficient passages in culture to eliminate the dilution factor.

Credit for growing trachoma virus in quantity and in series for the first time must go to T'ang and associates in Peiping. These investigators were able to isolate four strains on yolk sac, to cultivate them in series, and to transmit them to other laboratories. Confirmation soon came from Collier and associates who extended T'ang's observations to show that cultivated virus would produce typical infection in human volunteers. Thus the British investigators were the first to satisfy the WHO committee's criteria.

Since the publication of the results of these two initial outstanding and long-awaited investigations, other research groups have followed suit. The Harvard group headed by Snyder has cultivated strains from trachoma in Saudi-Arabia, Egypt, and Taiwan. A team in Israel (Bernkopf, Nishmi, Maythar, and Feitelberg: Arch. Ophth., 62:33-34 [July] 1959) has recently reported an isolation and the successful inoculation of a human volunteer with fifth-passage virus. The first isolation from trachoma in the United States, with the production of inclusion-positive trachoma in monkeys, has just been accomplished by the University of California viral keratitis group. It is expected that the virus will soon be isolated from trachoma in all parts of the world. It will then be possible to study any strain differences that may exist.

Already new knowledge of certain biologic properties of the virus has been gained. It is known, for example, that like other members of the psittacosis-lymphogranuloma group, trachoma virus can elaborate a toxin. Preliminary evidence suggests antigenic differences between toxins from different strains. Further research should clarify the relationship between trachoma virus and the other members of this group, particularly the virus of inclusion conjunctivitis. It should also determine the feasibility of vaccine prophylaxis and lead to improvement in chemotherapy.

It is of interest that experimental trachoma produced in lower monkeys (rhesus, cynomolgus sp.) by tissue transfer differs markedly from the experimental trachoma produced by cultured virus in the same animals. The tissue-transfer trachoma is a low-grade follicular conjunctivitis of insidious onset with minimal exudate and without demonstrable inclusions; the trachoma induced by virus-rich culture has an acute or subacute onset with abundant exudate, readily demonstrable inclusions, and sometimes free elementary bodies. As in human trachoma of acute or subacute onset, the initial tissue reaction of the culture-induced monkey disease is papillary, follicles predominating only as the tissue reaction subsides. These findings mean that under these circumstances the monkey has become a reliable animal for the study of trachoma virus. Regrettably it fails to develop either keratitis or cicatrization, but the ever-present problem of the spontaneous folliculosis of monkeys, which so plagued early workers with experimental trachoma, is no longer a differential problem since the culture-induced experimental disease can be identified clinically and yields readily demonstrable inclusions.

The cultivation of inclusion conjunctivitis

virus, both from the infant's eye and the mother's cervix, has now also been reported (Jones, Collier, and Smith: Lancet, 1:902, 1959). The claim has yet to be confirmed but the supporting evidence is convincing. Speculation on the relationship between inclusion conjunctivitis virus and trachoma virus has been a source of endless confusion which the availability of the two viruses in culture should help resolve.

In the history of medical investigation, a great forward surge of knowledge of the diagnosis, epidemiology, treatment, and control of a communicable disease has commonly followed the successful identification and propagation of its causative agent outside the natural host. Such a forward surge in our knowledge of trachoma should now follow the successful cultivation of trachoma virus.

Phillips Thygeson.

MOACYR ALVARO

And the Pan-American Association of Ophthalmology

It is certain that every ophthalmologist in the Western Hemisphere knows of the Pan-American Association of Ophthalmology. Many of them are active members. More are joining each year. The vigorous growth of this useful organization since its birth 19 years ago is only extraordinary if you consider the great extent of the geography involved, the expense and time required for travel to and from its congresses and interim congresses, and the great barrier of language differences. It is not extraordinary if you consider the characters and dynamic energies of its founders, Harry Gradle and Moacyr Alvaro.

In May, 1939, Harry Gradle and Moacyr Alvaro developed the idea through correspondence. War was imminent and, realizing that an International Congress would probably not be held soon or in the remote and uncertain future, these two extraordinary men "evolved a working plan which called for the moral and financial backing of a strong society of ophthalmologists and the official support of the U.S. Department of State." (Stice, L.: The Pan-American Association of Ophthalmology: A historical sketch. Ophthalmologia Ibero Americana, 1955.)

This plan was submitted to the Council of the American Academy of Ophthalmology and Otolaryngology and quickly approved and money to support the project was voted. An organizing committee consisting of Moacyr Alvaro, Harry Gradle and Conrad Berens was appointed. Harry Gradle was the chairman. The U.S. State Department gave it official blessing and valuable moral support.

The first organizing meeting and congress was held in Cleveland, Ohio, immediately following the annual meeting of the American Academy of Ophthalmology and Otolaryngology, in October, 1940. The official attendance at this first congress was remarkably good, especially when it is borne in mind the short time interval between the initiation of the plan and its fruition. It was not difficult to interest and to notify the ophthalmologists of North America of the scheme. It was quite another story to spread the message around Latin America. Here is where the organizing ability, the administrative skill, and the remarkable drive of Alvaro first became apparent to most of us. He assembled, with much difficulty, a list of the Latin American ophthalmologists and personal invitations were forwarded to them through the State Department. Generous contributions to support the project were made by the American Optical Company, the Bausch and Lomb Optical Company, and Abbott Laboratories. As a result of Alvaro's herculean efforts all the universities, clinics, and orgainzed medical groups interested in ophthalmology in the 21 countries of North, Central and South America were invited to send representatives and the United States Government invited the Latin American countries to appoint official representatives (Stice).

The organizing committee worked most assiduously against time to get the scheme in running shape. In addition to a sound plan of organization, quickly adopted by members of the first congress, the committee arranged for a scientific program which was remarkably good. The papers were presented in the official languages, Portugese, Spanish and English. Abstracts of the papers in the various languages were translated and projected simultaneously with the delivery of the papers. This scheme worked fairly well, as those who were at the original meeting will recall.

Harry Gradle was elected president and, among other officers, Alvaro was elected executive secretary for the countries south of Panama, Conrad Berens for the countries north of Panama. The massive burden of work involved fell mostly on the shoulders of these three men. Since organized ophthalmology north of Panama was in excellent condition, Berens had a somewhat lighter task to perform. The main burden of rounding up the Latin American ophthalmologists, without whom the association would be a failure, fell on Moacyr Alvaro.

This remarkable man, who spoke many languages fluently, might be likened to the glue that holds the many parts of a fine piano together, without which the instrument would fall apart and could no longer give forth sweet music. He was a most efficient glue, as the health of the association attests. Its present success can, as I am sure most of us will agree, be attributed mostly to him. This is not to belittle in any way, the splendid work of all of the officers, members of committees and members of the association, who have toiled so hard during these 19 years, throughout the Western Hemisphere, to make the association the enthusiastic and vigorous body that it is, and of which we are so proud.

At the time of its inception, to many of us north of Panama, Latin America was an enigma. To our shame few of us knew, or even now know, the languages involved. The various political activities of the different countries were and are difficult for most of us to follow and understand, and the subtle nuances of the make-up of the ophthalmologists of Latin America, and ourselves, are sometimes incomprehensible to some of us. Thanks to Moacyr Alvaro's skill, charm, and great ability, many of these barriers have fallen, and the association is now a closely knit and most friendly unit with great power for the good of our peoples and for ophthalmology. This is, I think, Alvaro's greatest achievement.

In recognition of his great service to us, he was elected president in January, 1952, and served in this office most effectively and successfully, for the power and prestige of his office enabled him to put into effect the extraordinary and numerous fertile ideas of organization that he advanced.

When his term of office expired in 1956, he was unanimously chosen to be the executive secretary of our association and, in spite of ill health and with magnificent courage, he continued to foster, advance, and bring into being the dreams and aspirations of our founders, but chiefly his own. His work entailed much long and arduous travel and extensive absences from his own work as a skilled practitioner and teacher of ophthalmology in his own city of São Paulo, Brazil. He accepted all the heavy responsibilities of his office with cheerfulness and great patience. His linguistic ability enabled him to follow with ease the flood of verbal and written communications that came across his desk. He was seemingly tireless and up to the end showed no evidence of fatigue at the conclusion of long sessions of committee meetings of all sorts. His enthusiasm for the welfare and multiple activities of the association and its various congresses was highly contagious and, as a result, he was surrounded by a large number of loyal and ardent workers in the cause. This is his heritage.

Our loss cannot be measured. There was only one Alvaro and his death has left an empty chair that cannot be filled. He has left us a thriving organization of great scientific importance in the world, he has brought to

all of us many enduring and dear friendships throughout the Western Hemisphere, friendships that would never have taken place without him. On this score alone we are indeed most grateful.

We must all see to it that the glue that put us together never becomes unstuck. This we owe to Moacyr Alvaro.

Derrick Vail.

OBITUARIES

MOACYR ALVARO, M.D.
1899-1959

Dr. Moacyr Alvaro, executive director and past-president of the Pan-American Association of Ophthalmology, died at the age of 59 years following a cerebral hemorrhage in São Paulo Hospital, São Paulo, Brazil, Sunday, July 19, 1959.

Moacyr Eyck Alvaro Marquis da Silva da Cunha e Fernandes was born August 12, 1899, in Santos, the seaport of São Paulo, Brazil. His father was a prominent ophthalmologist and encouraged his son in his future career. After completing his medical course at the University of Rio de Janerio in 1922, Dr. Alvaro began his specialty training at the University of Vienna and completed it with work as an assistant in the Polyclinic of Berlin.

On returning to Brazil in 1926, Dr. Alvaro established a successful practice in São Paulo. About this time, societies of ophthalmology were organized in São Paulo and Rio de Janeiro. He became an enthusiastic member and was able to organize the first Brazilian Congress of Ophthalmology in São Paulo in 1935. The meeting was so successful that the congresses became biennial affairs and were attended by many foreign as well as Brazilian ophthalmologists.

Following a successful campaign against ophthalmia neonatorum in the immediate area, Dr. Alvaro was able to interest the medical profession of Brazil in a definite program for the prevention of blindness. This activity led him to establish the first glaucoma clinic in South America. He also developed an orthoptic center in São Paulo.

MOACYR ALVARO, M.D.

In 1937, Dr. Alvaro with a group of associates established the Ophthalmological Studies Center in connection with the Paulista School of Medicine, where he was professor of ophthalmology. The classes were limited to 80 postgraduate students annually and became extremely popular in South America.

While attending the International Congress of Ophthalmology in Cairo, Dr. Alvaro with the late Dr. Harry Gradle of Chicago and Dr. Conrad Berens of New York developed the original plans for the organization of the Pan-American Association of Ophthalmology. During the meeting of the American Academy of Ophthalmology and Otolaryngology in Cleveland, Ohio, in 1940, the first meeting was held and Dr. Alvaro was elected

secretary for South America. He was given the task of developing the society in the southern countries, which he accomplished with great efficiency.

About this time, Dr. Alvaro made a survey of eye injuries in Brazilian industry and became so interested in efficiency in management that he joined and later became president of IDORT, the business efficiency organization of Brazil.

Dr. Alvaro suffered a severe cerebral hemorrhage in Europe in the spring of 1955. His right side was affected and as soon as he was able he came to New York for rehabilitation treatment. He returned to his home in the fall and resumed his activities with his usual vigor and interest.

At this time, Dr. Alvaro was president of the Pan-American Association of Ophthalmology and vitally concerned with the Vth congress, which was held in Santiago, Chile, in 1956, and was most successful. He was rewarded for his efforts by his election to executive director at that meeting.

Following the Chilean congress, Dr. Alvaro arranged many successful lecture tours in South American countries for prominent ophthalmologists of the United States and Europe.

As executive director, Dr. Alvaro stimulated more than 100 South American ophthalmologists and their families to attend the successful IVth interim congress held in New York in 1957. He was the moving spirit behind the II cruise congress in the Carribean area in 1958.

Dr. Alvaro had the distinction of representing the Pan-American Association of Ophthalmology on the International Council while he was president and later represented South America. In this position, he supported ophthalmology of the Western Hemisphere and the United States with greatest zeal.

Just before his last illness, Dr. Alvaro had completed a strenuous tour of South America in behalf of the coming VIth congress of the Pan-American Association of Ophthalmology to be held in Caracas, Venezuela, early in 1960. On returning to his home in São Paulo, he was ill and admitted to the hospital for the last time.

Dr. Alvaro was a member of the National Academy of Medicine of Brazil, the College of Surgeons of Brazil, the American College of Surgeons, the American Academy of Ophthalmology and Otolaryngology, and the American Ophthalmological Society. He was a diplomate of the American Board of Ophthalmology and a consultant to the New York Eye and Ear Infirmary.

Dr. Alvaro's immediate survivor is his devoted wife, the former Helen Pomeroy of Boston, who did so much to make him comfortable in his last years of life.

Ophthalmology of the Americas has lost a champion and the United States a true friend with the passing of Moacyr Alvaro.

Brittain F. Payne.

BERNARD SAMUELS
1879-1959

Dr. Bernard Samuels, former attending surgeon and pathologist of the New York Eye and Ear Infirmary and professor emeritus of ophthalmology of Cornell University

BERNARD SAMUELS, M.D.

Medical College, died after a long illness at the age of 80 years in his summer home at Wiscasset, Maine, Sunday July 26, 1959.

Dr. Samuels was president of the XVII International Congress of Ophthalmology, which he obtained for New York in 1954. He served on the Board of Directors of the National Society for the Prevention of Blindness and was a member of the Executive Committee at the time of his death.

Born in Front Royal, Virginia, Dr. Samuels received his early education at Randolph-Macon Academy and Doctor of Medicine from Jefferson Medical College in Philadelphia. His training in ophthalmology was received under the direction of the late Prof. Ernst Fuchs of Vienna and he continued his work in Prague and Berlin before he returned to the United States.

While in Europe, Dr. Samuels became proficient in languages and spoke German and French fluently and was able to converse in Spanish and Italian. He became interested in the history of ophthalmology and the development of eye hospitals in the Americas. This background aided him in his future writings on the progress of ophthalmology in the United States and especially concerning the New York Eye and Ear Infirmary.

Through the influence of Prof. Fuchs, Dr. Samuels developed special talent for ophthalmic pathology. With the slides he made himself and the preparations he was able to obtain in Vienna and Prague, Dr. Samuels returned to New York prepared to give his course in histopathology of the eye with great success.

In 1914, Dr. Samuels joined the ophthalmic staff of the New York Eye and Ear Infirmary in the clinic of the late Dr. Robert G. Reese. He became an instructor in ophthalmology in the Cornell University Medical College and was made full professor of ophthalmology in 1927, a post he occupied until his retirement in 1946. He introduced the study of histopathology of the eye in the sophomore year of the medical curriculum, which was an innovation at the time and proved extremely popular.

Dr. Samuels was elected to the positions of attending surgeon and pathologist at the New York Eye and Ear Infirmary in 1930. His clinic became one of the most active at the infirmary; on one memorable operating day, more than 30 operations were performed by him and his staff. He conducted his course on histopathology in the evening with the assistance of Dr. Edgar Burchell, as a part of the Post-Graduate School of the New York Eye and Ear Infirmary. Students from all parts of the world attended the lectures. It was during this period that the famous collection of slides for teaching was prepared in the Eno Laboratory of the Infirmary. He became an advisory surgeon and pathologist of the hospital in 1946, the time of his retirement.

Dr. Samuels served as editor of the *Transactions* of the American Ophthalmological Society for many years and succeeded Dr. Arnold Knapp as representative to the International Council of Ophthalmology. He attended the council for the last time in Brussels just prior to the XVIIIth Congress in 1958.

With the aid of the Board of Directors and the Board of Surgeons of the New York Eye and Ear Infirmary, Dr. Samuels established the Institute of Ophthalmology of the Americas, a postgraduate teaching division of the hospital. It received enthusiastic support from Dr. Moacyr Alvaro of São Paulo, Brazil, the executive director of the Pan-American Association of Ophthalmology, and many other Latin American ophthalmologists. Since the opening in 1957, the institute has been patronized by many students from North and South America.

In addition to being a student of history, Dr. Samuels was a collector of rare books, works of art, and antiques. He established a library in one of the old houses on his estate in Front Royal, Virginia, and furnished the main house with many interesting objects. He was a member of the New York Historical

Society, the Sons of the Revolution, the St. Nicholas Society, the Veterans of Foreign Wars, the Century Club, and the Southern Society. He served as a major in the Medical Corps of the American Expeditionary Forces in World War I and became identified with many patriotic enterprises.

Due to his interest in the library and portraits of the founders, directors, and surgeons of the New York Eye and Ear Infirmary, the Samuels Library was established and named for him in a special ceremony in 1954.

Dr. Samuels was a member of the leading medical and scientific societies of the world. He was a bachelor and lead a quiet "retired type" of life but enjoyed the company of his friends and former students. He is survived by a brother and two nieces and a host of grateful students.

Brittian F. Payne.

CORRESPONDENCE

Correction

Editor,
American Journal of Ophthalmology:

In my article, "Treatment of squint amblyopia with the after-image method," in the June, 1959, issue of THE JOURNAL, I have discovered an error on page 809 (volume 47) which may lead to basic misunderstanding of an important principle. The sentence which begins the eighth line from the top of the second column, page 809, ends: ". . . to improve the co-ordination between eye and brain." It should end: ". . . to improve the co-ordination between *eye and hand.*"

I would appreciate if you would publish a short note of correction in one of the next issues of THE JOURNAL.

(Signed) G. K. von Noorden, M.D.
Iowa City, Iowa.

Veterans Administration Hospitals

Editor,
American Journal of Ophthalmology:

The Medical and Chirurgical Faculty of the State of Maryland (Maryland State Medical Association) has, for many years, expressed concern over the inroads the Veterans Administration Hospitals are making into the realm of the private practice of medicine. In order to combat the fantastic growth of treatment of nonservice-connected ailments of veterans, the Faculty has passed many resolutions condemning this practice and urging that something concrete be done to curtail or stop this insidious growth.

The Faculty's House of Delegates at its 1959 annual meeting passed a resolution that all component medical societies of the American Medical Association be contacted and urged to support the Faculty's stand in this respect.

As a result of a letter sent to every A.M.A. component medical society, 11 answers have been received, all in the affirmative.

It is anticipated that other societies will also reply in the affirmative and that full support to this projected concerted action will be forthcoming from them as well.

I sincerely hope that you will see fit to publish this letter and alert your readers to the steps that are being contemplated along these lines, not the least of which is the hope that an appropriate resolution will be introduced in the A.M.A.'s House of Delegates at its clinical session in Dallas in December.

(Signed) Amos R. Koontz, M.D.,
Chairman,
Committee on Veterans' Medical Care,
Baltimore, Maryland.

BOOK REVIEWS

LEXICON OPHTHALMOLOGICUM: Multilingual Ophthalmological Dictionary. Edited by M. E. Alvaro, São Paulo; M. Amsler, Zurich; H. Arruga, Barcelona; G. B. Bietti, Rome; and S. Duke-Elder, London. Basel/New York, S. Karger, 1959. 223 pages. Price: Swiss francs, 34.00.

A song by Shiller, an ode by Keats, or a lyric by Musset is a creation without which we should all be poor; for although thoughts may be shared, each language has its own native genius that in some respects is irreplaceable. But however true this may be in literature, it does not apply to science. Rarely,

does scientific writing become sublimated into an art; when it does we are the gainers; but the gain is incidental, for in this sphere language is secondary to sense, and to be meaningful to a multilingual audience, the beauty of individualism should give way to communal directness and simplicity.

So says Sir Stewart Duke-Elder in the *Preface* to this remarkable and useful tool for ophthalmology to which he has contributed the English part as efficiently as one would expect from him.

We are told that "this Ophthalmological Dictionary is modelled on the *Dictionnaire Polyglotte des Termes Médicaux* by Dr. A. L. Clairville (Paris, 1950). With such a system it is possible to have the ophthalmologic terms in six languages (English, German, Spanish, French, Italian, and lingua latin) compactly arranged in one volume in such a way that cross-references are easy.

"The terms are arranged in alphabetical order in English, each being numbered. The English section thus acts as a key. In the sections dealing with other languages, wherein the terms are also alphabetically arranged, the key number is repeated so that ready reference may be made to the first section when the term is translated into each of the other five languages."

For example, let us look up "Trabekel" in the German section. Here we find the number 2052. So we look up the number 2052 in the English section and we find trabeculae (s/pl), D. Trabekel (n) E. (for Espanol) trabéculas (f), F. trabécules (m/pl), trabeculum (m); I. trabecole (f/pl), L. trabeculae (f/pl). It is all very easy and simple.

The work, sponsored by the International Council of Ophthalmology, must, however, have been no easy or simple task to perform. No doubt some imperfections will be discovered as time goes on, but at first glance none could be spotted. I am sure that the authors would welcome attention directed to errors so that the next edition will be still more perfect.

Every ophthalmologist and every medical library in the world should have a copy at hand. It will help to overcome the language barrier in our field and lead to our enlightenment. We are grateful to the Council, to the authors, and to the publishers.

Derrick Vail.

REGULATION OF CELL METABOLISM. Edited by G. E. W. Wolstenholme and C. M. O'Connor. Ciba Foundation Symposium. Boston, Little, Brown and Company, 1959. 387 pages, 109 illustrations. Price: $9.50.

Ordinarily we think of the nervous system and hormones as the regulators of metabolism. However, on reflection it becomes evident that the eventual regulation must be by the cell itself and, as this symposium shows, even by minute constituents of the cell protoplasm.

Although this is indeed a symposium of "experts for experts" even the amateur biochemist can understand the beautiful electron microscope photographs in the article by Siekevitz. These show that the cell membrane may actually act to engulf particles and in a sense mitochondria and even the nucleus of the cell may have extracellular connections. Of particular interest also is Sir Hans Krebs' application of the electronic concept of "feedback" to cellular metabolism and enzyme action.

This volume will be of interest only to those investigators of the eye whose work lies at intracellular levels.

David Shoch.

L'HÉRÉDITÉ EN OPHTALMOLOGIE. By Jules François, M.D. Paris, Masson et Cie, 1958. 876 pages, 629 figures, 3 color plates, chapter bibliographies, subject, and author indices. Price: French francs, 8,000.

This monograph by François on the role of heredity in ophthalmology is a worthy successor of the classic dissertations by Nettleship (1909) and Franceschetti (1930). Its contents present the most authoritative, complete and up-to-date information available. The number of chromosomes in man are 46

(23 pair) (Tijo and Leven, 1956)—not 48 as previously considered.

The heredity of an individual—which is bound to the constituents of the fertilized ovum—is the genotype. The phenotype refers to the special findings in that person, as hereditary characteristics may or may not be manifest. Each of the sex chromosomes presents two segments, one set of which is homogenous and the genes thereof act independently of sex, like those of the other chromosomes. Such inheritance is autosomal. When a heterogenous segment of the sex chromosomes is occupied by an abnormal recessive gene, as for red-green color deficiency or Leber's disease, typical sex-linked inheritance results, with the abnormal gene dominant in males and recessive in females. Both males and females with dissimilar corresponding genes are heterozygots. If a heterozygous woman marries an affected man, half the daughters will be carriers (heterozygots) and half, defective (homozygots).

The penetrance of a gene expresses the frequency of phenotypic manifestation, and its expressiveness, the degree thereof. The heredity is recessive, dominant, or intermediary, depending on the feebleness or strength of penetrance or expressivity. Since penetrance is relative, the transmission of keratoconus, pigmentary retinopathy, or congenital nystagmus may be dominant or recessive. From a study of gene linkage and crossing-over, Haldane fixed the probable locus of the genes responsible for total achromatopsia and Oguchi's disease in the homogenous segments of the sex chromosomes.

All persons with serious hereditary affections of the eye should be advised not to marry, and marriage between first cousins should be discouraged. Sterilization can never solve the problem because of carriers and the appearance of new cases through mutation.

This work should command the attention of every ophthalmologist, for in no other branch of medicine is heredity so important.

James E. Lebensohn.

EFFECTS OF EARLY BLINDNESS. By Seymour Axelrod, Ph.D. New York, American Foundation for the Blind, 1959. 83 pages, bibliography, paper-bound. Price: $1.00.

This investigation is concerned primarily as to whether the sequelæ of blindness include an increased sensitivity in the residual sense modalities, and whether early perceptual learning is crucial for later perceptual and intellective skills. The author found that differences between sighted and early-blind subjects depend upon the finger tested. The early blind did have a lower threshold for the right index finger, due probably to increased use of this digit and increased attention to stimuli from it. Early blind subjects were inferior to sighted controls when required to solve matching problems in which the correct choice among three palpated objects or three auditory stimuli was the object or stimulus intermediate in space or temporal sequence. In a similar comparison between late and early blind subjects, the tactile matching test favored the late-blind. Blindness of late onset also imposed less deficit than early blindness in situations involving spatial integration. The differences between early-blind and sighted groups in complex tasks, though statistically significant, were nonetheless small. They are important in attesting to the role of vision and its substrate in the development of complex cognitive functions. Gifted blind persons may transcend the limitations noted only in group comparisons.

James E. Lebensohn.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

5

DIAGNOSIS AND THERAPY

Lederman, M. **Radiotherapy of cancerous and precancerous melanosis.** Tr. Ophth. Soc. U. Kingdom 78:147-164, 1958.

The author based treatment on the belief that precancerous melanosis is a radio-sensitive lesion whereas cancerous melanosis is radio-resistant. He questions this theory and reports a series of 17 cases. He feels that a flat nonelevated lesion responds less well than the elevated tumor. Extensive involvement of the fornices and lids and extensive deep pigmentation with minimal tumor formation are unfavorable manifestations. The histological appearance is of doubtful value as a guide to radio-sensitivity. A radioactive phosphorus (P 32) uptake test is usually worth while even though it is an index of tumor activity rather than of radio-sensitivity. Radiotherapy should be offered as an alternative method with the clear understanding that in the event of failure surgery will become imperative.

The precancerous lesion as determined by the clinical pathologist is a histologic lesion composed of altered cells; to the experimental pathologist it is a histologic lesion composed of altered cells which are known, on a statistical basis, to become cancerous with significant frequency. Treatment depends on the assessment of the clinical behavior of the tumor. The author advises against the routine use of radiotherapy for precancerous melanosis because full dosage must be employed since the reactions and risks of complications are the same as for malignant diseases. Radiotherapy may destroy the precancerous lesion but there is no security against recurrence. If recurrence occurs further radiation is usually inadvisable.

Observation must include an excision biopsy to establish a firm diagnosis. Radiotherapy is indicated if the pathologist is prepared to predict with reasonable confidence that the tumor will become malignant because, 1. the lesion is presenting aggressive clinical features, 2. the lesion by situation, size or extent threatens the size of the eye, 3. there are signs and symptoms of inflammation and, 4. the patient is under 45 years of age.

The aim of radiotherapy is to destroy the tumor permanently without provoking complications. This can be achieved only by beta radiation, the indications for which are precancerous melanosis and

early cancerous melanosis where the disease is limited to the limbus or bulbar conjunctiva and the fornices and lids are unaffected. Preliminary excision of any exuberant mass is undertaken to provide a flush surface for effective beta-irradiation.

Doses of 2,000-2,500 r are given at weekly intervals for four to six weeks with a total dosage of 10,000-15,000 r, with special contact lens protectors and applicators. Gamma radiation is indicated in malignant melanotic processes of the conjunctiva, of the globe, of the lids and fornices. It is provided by radon seeds which are sewn to the globe and by radio-tantalum wire mounted on a contact shell. High voltage X-ray therapy and telecurietherapy are reserved for the treatment of orbital recurrences. Among the unpleasant complications are cataract, atrophy and epilation of the lids, and corneal scarring or severe corneal damage. Beulah Cushman.

Perkins, E. S. **The role of toxoplasma in ocular disease.** Tr. Ophth. Soc. U. Kingdom **78**:123-134, 1958.

An acute anterior uveitis in a young person with a positive dye test may be a manifestation of toxoplasmosis. That which occurs in adults may be the recurrence of congenital infection but some no doubt is a directly acquired infection. It was found that 80 percent of the patients kept pets. Treatment is probably best achieved with pyrimethamine combined with sulpha drugs and perhaps with systemic steroid therapy.

Beulah Cushman.

Scassellati Sforzolini, G. **Treatment of herpes zoster with Neuramine.** Gior. ital. oftal. **10**:490-507, Nov.-Dec., 1957.

Neuramide was used successfully in 15 cases of herpes zoster ophthalmicus. It was given by injection. (2 figures, 1 table, 10 references) V. Tabone.

Siebeck, R. **Direct gonioscopy with the prism gonioscope.** Klin. Monatsbl. f. Augenh. **134**:825-829, 1959.

The characteristics of the available gonioscopes are briefly discussed. A new gonioscope is described which is based on the principle of a floating contact lens. It offers little inconvenience for the patient and a good gonioscopic view for the examiner. (5 figures, 10 references)

Gunter K. von Noorden.

Siegel, R. **A new retraction forceps.** A.M.A. Arch. Ophth. **61**:943, June, 1959.

An angulated, locked fixation forceps with a weighted handle is described. This forceps is used to grasp the conjunctiva and episcleral tissue just outside the limbus for retraction of the bulb during a strabismus operation. The weight of the forceps is sufficient to retract the globe without the help of an assistant. (2 figures) W. S. Hagler.

6
OCULAR MOTILITY

Delord, Emile. **Diplopia and television.** Ann. d'ocul. **192**:514-517, July, 1959.

The author reports the case of a young woman, aged 26 years, who had an incapacitating diplopia after strabismus surgery. Orthoptic exercises did not help. She was then given a prism bar and advised to watch television. She was gradually able to reduce the prism and eventually her diplopia disappeared. Lancaster testing showed the diplopia to be present but it no longer bothered the patient.

David Shoch.

De Mello e Oliveira, H. **Duane's syndrome.** Arq. brasil. de oftal. **21**:357-363, 1958.

This syndrome is characterized by congenital limitation or abolition of abduction, retraction of the globe, narrowing of the palpebral fissure and elevation with

adduction. It is usually unilateral, involving the left eye most frequently (about four to one) and affects females more often than males. Spontaneous diplopia is almost always absent, visual acuity is usually good in each eye, and a compensatory turning of the head may be observed. Variations from this picture do occur, such as vertical deviation, widening of the palpebral fissure, congenital cataract, amblyopia, and nystagmus. Pathologic examination has shown the lateral rectus to be absent or fibrotic, while the medial rectus may be wholly or partially fibrotic or have an anomalous insertion. The etiology of this fibrosis is obscure; it may be due to obstetrical trauma or congenital dysplasia. Cases have been observed in patients born by Caesarian section, however, refuting the theory of obstetrical trauma to some degree. Surgical correction of the strabismus may be done for cosmetic purposes. A case history of the syndrome in a five-year-old girl is presented. (3 figures, 6 references)

James W. Brennan.

Ford, A. **Significance of terminal transients in electro-oculographic recordings.** A.M.A. Arch. Ophth. **61**:899-906, June, 1959.

Two-dimensional electro-oculograms were studied in 13 subjects. The so-called "overshoot potential" that has been previously described when alternate vertical fixation is performed seems to be an artifact and does not represent a vertical eye movement. These "rider artifacts" are felt to be due to adventitious potentials coming from as yet undetermined structures above the eyeball. (7 figures, 6 references)

W. S. Hagler.

7

CONJUNCTIVA, CORNEA, SCLERA

Alajmo, Arnaldo. **Relation between myopia and keratoconus.** Gior. ital. oftal. **10**:275-283, July-Aug., 1957.

The various theories of the etiology of keratoconus are reviewed. The author believes that the condition is probably due to aberration in development of the cornea which becomes manifest later. The mesenchimal changes in the cornea are believed to be correlated with similar changes at the posterior pole of the eye in some cases of myopia. (21 references)

V. Tabone.

Bick, M. W. **Surgical treatment of scleromalacia perforans.** A.M.A. Arch. Ophth. **61**:907-917, June, 1959.

The case of a 60-year-old man with a large area of scleromalacia perforans involving the entire lower nasal quadrant anterior to the equator is presented. This patient had severe rheumatoid arthritis of many years duration. In order to prevent perforation of the globe, which appeared imminent, the author performed a fascia lata graft to the sclera. This large graft covered three quadrants anterior to the equator and was anchored to all four of the rectus muscles as well as to the normal sclera surrounding the area of perforation. The graft healed uneventfully using only topical steroids and antibiotics during the postoperative period. The patient was followed for fourteen months and there was no evidence of any recurrence of scleromalacia, or of any inflammation during this time.

For smaller isolated scleral perforations the author recommends the use of a trephine to circumscribe the lesion and replacement of the defect with a piece of donor sclera. (7 figures, 16 references)

W. S. Hagler.

Caselli, Francesco. **Hemangioma of the conjunctiva.** Gior. ital. oftal. **10**:424-432, Sept.-Oct., 1957.

A case of hemangioma of the bulbar conjunctiva in a trachomatous patient is described. The author suggests that the chronic inflammatory process in the con-

junctiva may have determined the production of the angioma although there may also have been a congenital predisposition. (5 figures, 34 references)

V. Tabone.

Castroviejo, Ramon. **Plastic and reconstructive surgery of the conjunctiva.** Plast. & Reconstruct. Surg. **24**:1-12, July, 1959.

After severe injuries, or operations, or severe disease, the conjunctiva often develops more or less extensive symblepharon which may limit the size of the cul-de-sac or interfere with the rotation of the eye. The graft material best suited for the repair of an eye in which vision has been preserved is buccal mucosa.

For the treatment of vascularized leukoma and symblepharon, a total lamellar keratectomy and corneoconjunctivoplasty is indicated. These procedures may be done in several stages and after the vascularization has been controlled with the total lamellar keratectomy, a partial penetrating keratoplasty may be performed as the final step to rehabilitate the eye for vision. For vascularized leukoma and extensive symblepharon, a buccal mucosa graft must be combined with total lamellar keratectomy and corneoconjunctivoplasty to improve the condition of the eye, after which a partial penetrating keratoplasty may be performed. For recurrent pterygiums with or without symblepharon, a partial lamellar keratectomy and conjunctivoplasty may be combined with a buccal mucosa graft. If the rotation of the eye has not been affected, the part of the pterygium which has invaded the cornea is dissected free by means of a partial lamellar keratectomy. The adhesions between the pterygium and sclera are then freed and the pterygium is slipped back away from the cornea. The invading border is sutured 2 mm. beyond the limbus, anchoring each suture in the sclera. If the recurrent pterygium has developed excessive scar tissue which limits the rotation of the eye, the operation is similar to that performed for a symblepharon with pronounced protraction of the conjunctiva. The author describes his electrokeratotome, and new clamps to hold the mucosa.

Alston Callahan.

Coetzee, T. **Rhinosporidiosis of the conjunctiva.** Brit. J. Ophth. **43**:309-311, May, 1959.

Rhinosporidiosis is an infection caused by the fungus Rhinosporidium seeberi and is usually found as a granulomatous red mass attached to the mucous membrane of the nose. It is rarely seen in the eye but in this case a typical lesion was found in the lower portion of the conjunctiva of a 10-year-old child. It was easily removed and the diagnosis confirmed histologically. (3 figures, 11 references)

Morris Kaplan.

Hill, D. W. **Corneal vascularization after cataract extraction by zonulysis.** Brit. J. Ophth. **43**:325-329, June, 1959.

Corneal vascularization following cataract extraction by zonulysis in a 31-year-old man with retinitis pigmentosa is described. The other eye which had a routine intracapsular extraction served as control. Alpha-chymotrypsin must not be contaminated by hyaluronidase which is capable of attacking the corneal ground substance. Alpha-chymotrypsin may occasionally attack the cornea. (1 figure, 10 references)

Irwin E. Gaynon.

Machado, N. R. and de Almeida, A. M. **Juxta-limbal malignant melanoma of the conjunctiva.** Arq. brasil. de oftal. **21**:339-356, 1958.

This is an illustrated case report of a 75-year-old woman who developed a malignant melanoma at the site of a previous limbal naevus. It is assumed that the malignancy had existed more than 18

months prior to examination. Enucleation was advised but the patient refused. The tumor was then excised with diathermy coagulation of the bed of the tumor. The postoperative course was uneventful. Eight months later cataract extraction was done on the same eye with a good result. The cataract was present at the time of the original surgery, and was not a complication of the first operation. Complete examination at the time of cataract surgery revealed no evidence of recurrence or metastases. Histologic examination confirmed the diagnosis of malignant melanoma. The authors provide a brief review of ocular melanomata in general. (5 figures, 28 references)

James W. Brennan.

Marquardt, R. **The pathologic anatomy and genesis of progressive scleroperikeratitis.** Klin. Monatsbl. f. Augenh. **134**:872-885, 1959.

The literature on this rare condition is reviewed. Two cases are reported and the results of detailed histologic studies are given. The inflammatory changes in the coats of the anterior segment are closelly related to similar changes in adjacent blood vessels. Lymph nodules were found in episclera, choroid, and occasionally in the sclera in close relationship to the blood vessels. It must be assumed that the development of these nodules was stimulated by chronic inflammatory irritants originating from the vascular system. Connective tissue changes in the sclera closely resemble those found in rheumatism. The pathologic changes suggest that the disease is of rheumatic nature. (5 figures, 30 references)

Gunter K. von Noorden.

Miller, S. **Band-keratopathy with a report of a case of Fanconi's syndrome with calcium deposited in the cornea.** Tr. Ophth. Soc. U. Kingdom **78**:59-69, 1958.

Fanconi in 1931 reported the possibility that a defect of resorptive functions of the renal tubular epithelium, if unaccompanied by restriction of filtration through the glomerulus, may result in a reduction of metabolites in the blood. In Fanconi's syndrome there was osteomalacia due to deficiency of tubular resorption of phosphate with increase in urinary excretion of inorganic phosphorus which lowered the level of serum phosphorus. A second defect in the Fanconi syndrome is the production of chronic acidosis in which the mechanism of the kidney to form ammonia is defective and a third defect is the dissolution of bone salts and the use of the calcium to neutralize the acids which are the basis of acidosis.

In Fanconi's syndrome the difficulty is in precipitating a calcium-phosphate complex into an osteoid because of the low serum phosphorus but also because of an actual paucity of calcium cations which arise in the bones to neutralize the anions with which the kidney has failed to deal.

The object of the treatment is to raise calcium-phosphorus level in the serum and to neutralize the acidosis. Treatment consists of the use of large doses of calciferol plus alkali in the form of tablets of sodium and potassium bicarbonate. (9 figures)

Beulah Cushman.

Mitsui, Y., Hanna, M., Hanabusa, J., Minoda, R., Ogata, S., Kurihara, H., Okamura, R. and Miura, M. **Association of adenovirus Type 8 with epidemic keratoconjunctivitis.** A.M.A. Arch. Ophth. **61**: 891-898, June, 1959.

Using tissue culture methods the authors isolated 38 different strains of Type 8 adenovirus in 49 cases of clinical epidemicic keratoconjunctivitis in Japan. In the 35 cases in which paired sera were examined, there was a rise in the antibody titer to the Type 8 adenovirus in all instances. Isolation of the virus was most successful when conjunctival scrapings

were taken during the first week of the conjunctivitis. In no instance could the virus be isolated after the tenth day of the conjunctivitis, and in no instance could the virus be isolated when washings from the conjunctival cul de sac were used instead of scrapings.

It is stressed that in infants less than two years of age infection by adenovirus Type 8 has a different clinical manifestation; there is usually only a pseudomembranous conjunctivitis, and keratitis and preauricular adenopathy are rarely seen. Systemic symptoms occur in about one half of these infants and they are considerably milder than in pharyngoconjunctival fever.

The differential diagnosis between epidemic keratoconjunctivitis and pharyngoconjunctival fever is briefly discussed. (4 tables, 15 references) W. S. Hagler.

Rubino, A. **Suture for perforating keratoplasty.** Gior. ital. oftal. **10**:433-437, Nov.-Dec., 1957.

The author uses at least four lip-to-lip sutures. Those on the donor cornea are inserted when the trephine has cut only half way through the cornea. Additional sutures may be used. (8 figures)

V. Tabone.

Vancea, P., Munteanu, M. and Lazarescu, D. **Epidermolysis bullosum and corneal ulcer.** Ann. d'ocul. **192**:518-527, July, 1959.

The authors report the case of a two-year-old child with epidermolysis bullosum, a term they use interchangeably with "pemphigus." The skin lesions appear to be those of the latter disease. During the course of the disease a corneal ulcer appeared which was treated with the usual local drugs plus subconjunctival injections of total eye extract. The authors ascribe the healing of the corneal ulcer to the tissue extract injections. (20 references) David Shoch.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Beverly, J. K. A. **A rational approach to the treatment of toxoplasmic uveitis.** Tr. Ophth. Soc. U. Kingdom **78**:109-121, 1958.

It has been estimated that toxoplasma is the causal agent in 25 to 75 percent of posterior uveitis of the granulomatous type. Clinically quiescent cases are the result of previous primary infection and probably congenital. In a few quiet cases the infection may be completely burned out while in others it is latent. The majority of active cases are probably flare-ups of old smoldering lesions. Host response varies with the virulence of the strain, the infecting dose, and the species of the host.

In most laboratory animals which are not immune even a few virulent organisms will cause death in four to nine days. A generalized infection occurs with parasitaemia, pneumonia, hepato-splenomegaly, exudates in the body cavities and meningo-encephalitis. With attenuated strains there may be no clinically detectable signs of general infection except perhaps anorexia and loss of weight. The animals quickly recover and subsequently behave normally. If the infecting inoculation is made into a part of the body where the degree of local host reaction can be estimated, as in the anterior chamber, two periods of marked response with a well-defined remission between them will be noted. The first seems to be due to the toxic effect of the organism and the second a hypersensitivity reaction coming on as the animal develops antibodies. In an immune animal the general effects are absent but there is a local response. The reaction in the immune animal can be almost completely suppressed by cortisone given systemically.

In active human uveitis there are three

main possible causes of acute exacerbation, 1. the reactivation of infection with gross local proliferation of free forms following upon rupture of a cyst, 2. hypersensitivity reaction of the delayed tuberculin type, specific for toxoplasma cyst contents, and 3. a hypersensitivity not to toxoplasma protein but the antigens produced by breakdown of tissue.

The drugs giving the best results in treating experimental toxoplasmosis in animals have been the sulphonamides, dyphenyl sulphones and pyrimethamine. These drugs are growth inhibitors and when combined with cortisone have a much more marked effect.

Beulah Cushman.

Caselli, Francesco. **Ossification in the choroid in a microphthalmic eye.** Gior. ital. oftal. **10**:468-489, Nov.-Dec., 1957.

Caselli describes ossification of the choroid in a microphthalmic eye. Intrauterine infection may be the cause of both the ossification and the arrest of growth of the eye. (16 figures, 67 references)

V. Tabone.

Miani, Paolo. **Three cases of iridocyclitis in Asian flu.** Gior. ital. oftal. **10**:442-446, Nov.-Dec., 1957.

Three cases of hypertensive iridocyclitis during the course of Asian flu are described and a specific cause, i.e., the influenza virus, is postulated. (10 references) V. Tabone.

9

GLAUCOMA AND OCULAR TENSION

Fois, A. and Frezzotti, R. **Encephalograms in glaucoma.** Gior. ital. oftal. **10**: 414-423, Sept.-Oct., 1957.

Electroencaphalographic studies were carried out in 118 cases of glaucoma and the tracings were abnormal in 60 percent; there were rapid frequencies in 30 patients, mixed frequencies in 18, small sharp spikes in 12, and in six there were small sharp spikes with rapid frequencies. The possible relation between these findings and the type of glaucoma and the significance of pathologic cerebral waves is discussed. (6 figures, 1 table, 14 references) V. Tabone.

Giessmann, H. G. **Acute bulbar hypotony.** Klin. Monatsbl. f. Augenh. **134**: 890-892, 1959.

Acute bulbar hypotony occurred in a 60-year-old man with hypopotassemia. Treatment of the underlying condition resulted in rapid normalization of the intraocular pressure. (4 figures, 14 references)

Gunter K. von Noorden.

Langham, Maurice E. **The action of carbonic anhydrase inhibitors on the intraocular pressure.** Tr. Ophth. Soc. U. Kingdom **78**:71-82, 1958.

The immediate fall in the intraocular pressure and the continued low pressure after the oral or intravenous use of the carbonic anhydrases is well known. The use of Diamox and the new carbonic anhydrase Neptagene (Lederle Laboratories) by mouth or intravenous injection causes the ocular tension to fall in normal and glaucomatous human and animal eyes. The effect usually occurs within 10 to 20 minutes. Apparent resistance to the drug in man is attributed to electrolyte changes in the body which can be restored by administration of potassium bicarbonate.

It has been determined that intraocular pressure of glaucomatous eyes may be controlled for many weeks by therapy with miotics and Diamox. On the basis of tonographic studies the rate of flow of the aqueous has been calculated to decrease by 60 percent. This rapidity of action is consistent with the view that the drugs act directly on the secretory mechanism within the secretory cells of the ciliary processes.

The fundamental process of secretion into the aqueous might be considered to be an exchange of hydrogen ions derived from cells for sodium ions from the blood and carbonic anhydrase facilitates neutralization of the residual hydroxyl and hydrogen ions in the cell. This concept is consistent with much of our experimental knowledge. (6 tables)

Beulah Cushman.

Menna, F. **The velocity of aqueous outflow in various antiglaucoma interventions (iridectomy, sclerectomy, iridencleisis, and trephine).** Arch. di ottal. **63**:39-44, 1959.

After 35 operations—iridencleisis, sclerectomy, and trephining—the outflow improved in excellence in the order in which the operations are named. (4 tables, 10 references)

Paul W. Miles.

Nordmann, Jean. **Certain fundamental questions concerning glaucoma.** Ann. d'ocul. **192**:482-508, July, 1959.

This is apparently the first of a series of articles on two basic questions in glaucoma: 1. Is glaucoma a cerebral disease and 2. Is hypertension the fundamental element in glaucoma? In this article the author addresses himself to the question of the existence of a tonoregulator in the diencephalon.

He first reviews the clinical evidence for the existence of a such a center. He points out that there are variations in ocular tension in disease of the pituitary and diencephalon but that these variations are easily explained on the basis of changes in the vascular stability of the eye and that in any case the eye is capable of minimizing these variations and no true glaucoma has been demonstrated in these patients.

The experimental evidence for a diencephalic center is then reviewed. The author has several objections to the use of the rabbit as an experimental animal and states that although obscuration does increase the intraocular pressure this is in no way related to simple glaucoma in man. He then discusses the homeostatic mechanism of the eye. Although it is true that various endocrine preparations and drugs may change the vascularization of the eye, in general the eye tends to minimize these alterations and to compensate for them.

He then investigates the afferent (trigeminal) and efferent (sympathetic) connections between the eye and the diencephalon. Stimulation and sectioning of these pathways do alter the tonus of the eye but again only via vaso-motor changes and the normal eye can quickly compensate for these alterations. The final section of this paper deals with the possible emotional origin of glaucoma. Although elevation of tension can be caused by emotional upsets, true glaucoma results only in a previously diseased eye. True emotional glaucoma is rare and when it occurs it is usually in the form of congestive glaucoma and usually in women.

Conclusion: from the point of view of tension, glaucoma is an ophthalmologic and not a cerebral disease.

David Shoch.

Perraut, L. E. and Zimmerman, L. E. **The occurrence of glaucoma following occlusion of the central retinal artery.** A.M.A. Arch. Ophth. **61**:845-865, June, 1959.

The authors briefly summarize and review 26 previously reported cases of glaucoma secondary to occlusion of the central retinal artery, and report in detail the histologic findings in six additional cases gathered from the files of the Registry of Ophthalmic Pathology. In the majority of these cases there was an abrupt onset of ocular pain due to secondary glaucoma which typically occurred within nine weeks of the time of arterial occlusion. In

all of the reported cases, the intraocular pressure at the time of occlusion and for a while thereafter was normal.

The pathogenesis of glaucoma after occlusion of the central retinal artery is no better understood than is the glaucoma which follows occlusion of the central retinal vein. The pathologic picture in the anterior segment of the eye in the two situations, also, is very similar, both in early and late cases. In the early stages, there is an outgrowth of mesenchymal cells from the uveal tissues of the iris root. These cells invade the chamber angle and form a delicate membrane along the inner surface of the trabecula. This membrane provides the initial obstruction to aqueous outflow and it is only later that varying degrees of anterior senechiae and ectropion uveae are seen.

The treatment of this secondary glaucoma is generally just as unsuccessful as in glaucoma secondary to obstruction of the central retinal vein. (22 figures, 34 references) W. S. Hagler.

Samuelly, C. **Glaucoma secondary to traumatic cataract.** Arch. di ottal. **63**:15-22, 1959.

The author discusses various complications of traumatic cataract. More eyes could be saved if blood clots in the anterior chamber were removed before angle closure or obstruction occurs.

Paul W. Miles.

Schlitter, K. **Is the effectiveness of interventions to obliterate the ciliary arteries actually due to vascular occlusion? Clinical and histological experiences with obliteration of ciliary arteries and quadrant diathermy in chronic glaucoma.** Klin. Monatsbl. f. Augenh. **134**:836-847, 1959.

Diathermy of the ciliary body has been reported to decrease aqueous formation while the resistance to outflow remains unchanged. This method has thus found acceptance for treatment of chronic glaucoma. Obliteration of the ciliary arteries has been thought to be the effect of this type of surgery. The histologic examinations of four eyes in which diathermy of the ciliary arteries was attempted revealed, however, that actually only little obliteration of the vascular lumen had taken place.

To decide whether vascular obliteration or diathermy of the ciliary body per se is effective, the author compared two groups of patients. He operated on 54 eyes, using a method described by von Wolffersdorff. Obliteration of the ciliary arteries was attempted. Surgery was performed on 51 eyes using scleral quadrant diathermy and deliberately avoiding the ciliary arteries. The results obtained by each method revealed no significant difference. Obliteration of the ciliary arteries is apparently no prerequisite for the good therapeutic effect of ciliary body diathermy. Other factors must be responsible for the success obtained with both surgical methods, which can be recommended as harmless and effective in the treatment of chronic glaucoma. (1 table, 38 references)

Gunter K. von Noorden.

Slezak, H. **The influence of dichlorphenamid on the ocular pressure in glaucoma.** Klin. Monatsbl. f. Augenh. **134**: 829-832, 1959.

Dichlorphenamid belongs to the group of carbonic anhydrase inhibitors and is chemically related to sulfanilamid. The carbonic anhydrase inhibiting action is 30 times as effective as in Diamox. The intraocular pressure was significantly decreased in 30 eyes with glaucoma simplex when the drug was given orally. Intravenous administration of the drug in ten eyes with acute glaucoma lowered the pressure in less than one half of the patients. (2 tables, 5 references)

Gunter K. von Noorden.

Stanworth, A. **Conjunctival fibrosis after filtration operations.** Tr. Ophth. Soc. U. Kingdom **78**:43-58, 1958.

The author describes the adequacy of filtration blebs. A good filtration bleb has intraocular fluid extending beyond the bleb beneath the adjacent conjunctiva. The filtration bleb may, on the other hand, be sharply delimited by scar tissue restricting the filtrating function and making further surgery necessary. The polycystic bleb may also be secondary to fibrosis at the edge of the bleb and intraocular fluid drained into the large bleb may account for very low ocular tension. The bleb associated with restricted filtration may be associated with raised ocular tension. (8 figures) Beulah Cushman.

Stepanik, J. **The behavior of scleral rigidity during the Priscol test.** Klin. Monatsbl. f. Augenh. **134**:833-835, 1959.

A solution of 10 mg. Priscol was injected subconjunctivally in 54 eyes with glaucoma simplex. Measurements of the scleral rigidity before and after injection revealed only a statistically non-significant difference. (1 table, 6 references)

Gunter K. von Noorden.

Weekers, R. **The limits of physiologic intraocular pressure.** Ann. d'ocul. **192**: 509-513, July, 1959.

The author reviews the figures for normal ocular tension given by various authors. He concludes that the average normal is between 15.5 and 17 mm. Hg. Statistical evaluation shows that two sigma from the mean would lie between 20.5 and 22.5 mm. Hg and three sigma between 23 and 25.2 mm. This indicates that statistically only one person in 666 can have a tension higher than this last figure and not have ocular hypertension. Any patient with such a tension should be treated for glaucoma particularly if he is young and if there is a family history of glaucoma. (1 table, 5 references)

David Shoch.

Weekers, R., Prijot, E., Delmarcelle, Y., Watillon, M., Longuard, L., Guongard Rion, C. and Gustin, J. **The early diagnosis of incipient glaucoma.** Bull. Soc. belge d'opht. **121**:1-206, 1959.

Part I of this monograph deals in successive chapters with the fundamental principles of physiology, anatomy, and embryology as related to glaucoma. The relations between ophthalmotonus, blood supply of the retina and optic nerve, and pressure in the episcleral and conjunctival veins are discussed. The basis of tonography and the various types of tonometers are outlined with emphasis on the advantages or disadvantages in the use of specific models. Careful evaluation of the appearance of the disc, possibly on serial photographs is recommended, as well as the use of provocative tests, diurnal tension curves, and studies of visual functions. Perimetry is still considered to be the best single method for determining a progression of visual loss. Most clinicians prefer kinetic perimetry in spite of the great accuracy in static perimetry, especially for the detection of minimal normal and abnormal modifications in central and peripheral fields.

In the preface to the second part of the monograph the characteristics of the diverse types of glaucoma are defined. This part also contains detailed descriptions of the clinical picture of the various kinds of primary, secondary and congenital glaucomas. It also discusses the approach of the authors to their own investigations and resulting concepts of treatment. It is the authors' belief that facts concerning hypersecretion as the cause of glaucoma are not too well established and that an increase in episcleral venous pressure only should exceptionally be considered the reason for an increased ocular tension. For clinical purposes most glaucomas can be ascribed to defects in aqueous outflow. Tonometry still is considered the best simple method to determine the presence, potential pres-

ence, or absence of glaucoma. The value of this method definitely depends on the fulfilment of certain basic requirements, namely, the exclusive use of only standardized Schiøtz tonometers, adherence to the calibration data of Friedenwald and consideration of possible variations in scleral rigidity. Goldman's applanation tonometer may become the tonometer of choice because it minimizes the effect of abnormal scleral rigidity.

Routine tonometry should be done in all patients over 40 years of age by every ophthalmologist. Ophthalmologists also should pay closest attention to the chamber angle and to the presence of conditions which may lead to secondary glaucoma. The authors do not favor tonometry as a routine procedure for the non-ophthalmologist. They also are not enthusiastic about too much publicity in lay journals and daily papers. (343 references) Alice R. Deutsch.

10

CRYSTALLINE LENS

Agarwal, L. P., Gupta, R. B. L. and Malik, S. R. K. **Drug administration in cataract surgery.** Brit. J. Ophth. **43**:302-308, May, 1959.

Barbiturates, chlorpromazine, acetazoleamide, promethazine, and curare-like drugs were used in 150 cases of cataract surgery in India. Various combinations of these drugs were found to be more effective than any used alone and the addition of curare brought still better results. The use of Diamox is suggested as a valuable addition to the various other combinations. (5 references)

Morris Kaplan.

Cashell, G. T. W. **Complications and treatment of the hypermature cataract.** Tr. Ophth. Soc. U. Kingdom **78**:3-20, 1958.

Hypermature cataract were first described by Morgagni in 1764, and can be divided into a hard disc-like and the Morgagnian type. Two essential reactions may be induced by the cataract: a uveitis and glaucoma. The complications of the hypermature cataract are: 1. intumescence of the hypermature lens, 2. phakogenetic uveitis, 3. phacolytic glaucoma, 4. dislocation of the lens, and 5. spontaneous restoration of vision by absorption of lens material or clearing of Morgagnian fluid by dropping of nucleus, or complete posterior dislocation of the hard shrunken lens.

Treatment of the intumescent lens should be watched carefully for its dual action, irritative vasomotor reaction or its mechanical effect of closing part of the chamber angle. Beulah Cushman.

De Gaspare, F. and Montaldi, M. **Enzymatic zonulysis in some forms of congenital and complicated cataract.** Arch. di ottal. **63**:51-64, 1959.

About 40 percent of the cataracts extracted in the government hospital in Tripoli were considered complicated. Instead of the usual extracapsular extraction followed by needling, 88 patients were operated by the intracapsular technique using alpha-chymo-trypsin. Of a group of 26 inflammatory cataracts with iris adhesions, 14 showed a doubtful zonulysis. The capsule was ruptured in five, and there was loss of vitreous in three. In 16 the erysophake was used, while in the other 10 the Arruga forceps were used. In 11 cataracts with secluded pupil and glaucoma, the capsule was ruptured in one, and vitreous was lost in three. In three cases no noticeable effect of zonulysis was found, but in general there appeared to be softening of the adhesions between the lens and the iris. Similar results occurred in the extraction of 14 cataracts adherent to corneal leucoma, 18 cataracts with chronic simple glaucoma, 12 membranous post-traumatic

cataracts, and seven congenital cataracts in patients in their second decade.

In this series, enzymatic zonulysis was considered helpful, and apparently harmless. (1 table, 8 references)

Paul W. Miles.

Delogu, Antonio. **Changes in the lens in experimentally produced cataract.** Gior. ital. oftal. **10**:314-323, July-Aug., 1958.

In the posterior subcapsular region of cataractous lenses of experimental rabbits, collections of an amorphous substance as well as a swelling and degeneration of the lens fibers in this area were found. Such changes were not secondary to epithelial damage. The cataracts were produced by the introduction of adrenalin or protamine into the vitreous. The use of monoiodacetic acid by the parenteral route did not cause any lens changes. (4 figures, 16 references) V. Tabone.

Hudson, J. R. **Complications and treatment of hypermature cataract.** Tr. Ophth. Soc. U. Kingdom **78**:21-41, 1958.

Cataract surgery is undertaken to, 1. improve or restore vision, 2. to restore binocular function, 3. to improve visibility of the interior of the eye, 4. to care for the associated inflammation, and 5. to bring about cosmetic improvement. The treatment for hypermature cataract is determined by the conditions present—intracapsular extraction where possible or extraction by any form of operation most familiar to the eye surgeon.

The care of the possible complications becomes most important because of the inflammatory reaction, glaucoma and possible dislocation. Operation should be carried out under general anesthesia if possible. Tension should be reduced by gentle massage of the eye for a five minute period before operation. Complete iridectomy is followed by removal of lens.

Beulah Cushman.

Nirankari, M. S. and Maudgal, M. C. **Microphakia.** Brit. J. Ophth. **43**:314-316, May, 1959.

Microphakia or spherophakia is a rare malformation of the lens, and the zonular fibers, which are weak, do not exert their usual traction on the equator of the lens. A 25-year-old man with this anomaly in each eye had secondary glaucoma which is ascribed to obstruction of the pupillary space. Ciliary staphyloma had resulted in both eyes. Lens extraction was followed by normal tension and improved vision. (2 figures, 2 references)

Morris Kaplan.

Orr, H. Campbell. **Some observations on the use of chymotrypsin.** Brit. J. Ophth. **43**:330-331, June, 1959.

Alpha-chymotrypsin is valuable in treating younger patients. Healing appears to be more rapid and the postoperative reaction is minimal. If curare is not used the pupil tends to contract a little. Using Arruga's forceps, the capsule may be picked up at the upper pole of the lens. Counter pressure must be maintained about the equator of the eye at its lower pole, while the lens is being grasped to prevent its falling back into the vitreous. Irwin E. Gaynon.

11

RETINA AND VITREOUS

Agarwal, L. P. and Malik, S. R. K. **Solar retinitis.** Brit. J. Ophth. **43**:366-370, June, 1959.

Solar retinitis was observed 56 times after sun gazing and looking at a solar eclipse. The severity of the lesion was dependent upon the amount of solar rays absorbed. Retrobulbar injection of Priscolene is the treatment of choice early in the course of the disturbance when there is angiospasm and ischemia. With the advent of ischemic necrosis the prognosis is poor. (2 tables 8 references)

Irwin E. Gaynon.

Alagna, G. **The significance of the diphenylamine reaction in diabetic retinopathy.** Arch. di ottal. **63**:5-13, 1959.

When blood serum is treated with trichloracetic acid and diphenylamine is added, a rose colored substance is formed called "desossiesoso," $C_{14}H_{24}NO_{11}$. The test was done on the serum of 97 patients with various allergic eye diseases and diabetic retinopathy.

The highest concentrations were found in diabetic retinopathy, and the values in all cases were proportional to the serum mucoprotein. This suggested to the author that there is some relation of serum mucoprotein with the collagen diseases and that diabetic retinopathy may be a collagen reaction. (1 table, 18 references)

Paul W. Miles.

Alajmo, Arnaldo. **Ocular complication in Asian flu.** Gior. ital. oftal. **10**:438-441, Nov.-Dec., 1957.

Two cases of unilateral retinopathy following Asian flu are described. (2 figures, 2 references)

V. Talone.

Alström, A. H., Hallgren, B., Nilsson, L. B. and Åsander, H. **Retinal degeneration combined with obesity, diabetes mellitus and neurogenous deafness.** Acta Psychiat. et Neurol. Scandinavica, Supplement 129 **34**:1-35, 1959.

1. A clinical, endocrinological and genetic examination of a syndrome, which superficially might seem to be a variant of the Laurence-Moon-Bardet-Biedl syndrome, was carried out. The syndrome consists of "atypical retinal degeneration with loss of central vision, obesity, diabetes mellitus and neurogenous deafness." Polydactyly, mental deficiency and hypogenitalism were absent in the affected individuals. In one case, however, where a testicular biopsy was undertaken, a changing degree of tubular sclerosis was shown. The material consisted of three cases of the syndrome in two interrelated families. A case with the classical Laurence-Moon-Bardet-Biedl syndrome was used for purposes of comparison in the clinical and endocrinological examination.

2. The described syndrome shows a very similar picture in the three affected cases, who differ clinically and endocrinologically from the classical symptom picture in the Laurence-Moon-Bardet-Biedl syndrome. The combination of symptoms included in the present syndrome has not been previously described.

3. A man with the described syndrome and another man with a complete Laurence-Moon-Bardet-Biedl syndrome were examined for sex chromatin pattern. In the former case there was a male, in the latter a female pattern.

4. The genetic analysis indicates that the separate symptoms are manifestations of a recessive mutation in a single gene locus.

5. The genealogical analysis indicates that all the affected individuals represent manifestations of the same gene mutation.

6. It seems reasonable to suggest that the hypothetical gene mutation occurred relatively recently, although before the beginning of the 19th century. The greatest probability is that it occurred in the area where it has now manifested itself as a recessive autosomal condition. The main isolating factor from population-genetic viewpoint is that by distance. The "effective population size" for the population of the area dealt with, the parish where the probands were born, has been calculated for the period 1800-1850 by a method devised by Wright. The calculation gives no support for assuming any local random differentiation within the investigated area even 100-150 years ago.

7. The combined clinical and genetic analysis has lent support to the assumption that the syndrome in the present work is genetically distinct from the

main group of the cases which go under the designation Laurence-Moon-Bardet-Biedl syndrome and that it represents a genetic and clinical entity not previously described. (4 figures, 49 references)
Authors' summary

Bonavolonta, Aldo. **Ocular tension and retinal detachment.** Gior. ital. oftal. **10**: 257-274, July-Aug., 1957.

The relation between intraocular pressure and the various elements of retinal detachment were studied in ten patients. In only 20 percent of the cases was ocular tension appreciably lower in the eye with detachment whereas detachment in eyes with raised tension was exceptional. (41 references) V. Tabone.

Caselli, F. and Nuzzone, A. **Traumatic retinopathy of Purtscher.** Gior. ital. oftal. **10**:290-298, July-Aug., 1957.

A case of traumatic retinopathy of Purtscher is described. As the blood serum reactions of this patient were positive for syphilis, it is believed that this condition may have predisposed the patient to the ocular lesions. The various etiologic theories are reviewed and stress is laid on the predisposing factors, of which the instability of the neurovascular system is important. (1 figure, 17 references) V. Tabone.

Cavka, V. **Scleral buckling operation with rolled scleral flap.** Brit, J. Ophth. **43**:361-365, June, 1959.

The author describes his method of scleral buckling and presents three illustrative reports. The sclera is incised anteriorly and a flap five-sixth of the scleral thickness is dissected backwards. Cross incisions are placed in the flap to help it maintain its new position. Mattress sutures are placed through the equatorial part of the scleral flap from the inside outward and then through the limbal edge of the scleral incision. After diathermy the flap is rolled and the sutures drawn taut over the rolled flap. (4 figures, 6 references) Irwin E. Gaynon.

Dorello, U. and Scorciarini-Coppola, A. **Fluidemin in thrombosis of the central retinal vein.** Gior. ital. oftal. **10**:350-366, Sept.-Oct., 1957.

A new anticoagulant drug, Fluidemin (2-4-bromphenyl-1, 3-indandione), was used successfully in ten cases of central venous thrombosis. It was found more effective than other anticoagulants because it could be used in lesser doses and for shorter periods. (10 figures, 4 references) V. Tabone.

Malbran, J. and Malbran, E. **Some results in retinal detachment surgery.** Brit. J. Ophth. **43**:288-292, May, 1959.

This second series of 101 cases of retinal surgery follows an earlier report of 85 cases. The use of Schepen's indirect binocular ophthalmoscopy is recommended: with it cases previously called "desperate" were much more easily cared for. It permits more accurate localization of diathermy and so minimizes its application to normal regions. In the severe cases full-thickness scleral buckling with or without polyethylene tubing is advocated as the first procedure rather than as a last one after other methods have failed. The results reported were excellent. (7 references) Morris Kaplan.

Pau, H. **Which areas of the retina are prone to develop idiopathic detachment and must therefore be considered for prophylactic surgery?** Klin. Monatsbl. f. Augenh. **134**:848-862, 1959.

Traction bands between retina and the detached vitreous, and cystoid changes (Vogt) of the retina with atrophy and thinning, are the most likely causes for idiopathic retinal detachment. Pigmented and depigmented areas near the equator, close to blood vessels, and most frequently

in the superior temporal quadrant, can be seen ophthalmoscopically. It is assumed that these areas predispose to detachment.

Histologic examination of these areas reveals replacement of the retina by vascular connective tissue and modified pigment epithelium. The newly formed tissue tends to become sclerotic. These scleral patches develop in an area where the vitreous is attached to the retina. Liquefaction of the vitreous results in a retinal tear between normal retinal tissue and the sclerotic area. When prophylactic surgery is contemplated, the sclerotic areas should be considered as well as genuine retinal tears. (6 figures, 26 references) Gunter K. von Noorden.

Tòth, Z. **Fundus findings in the climacterium.** Klin. Monatsbl. f. Augenh. **123**: 812-818, 1959.

The fundus is characterized by vascular signs of fluctuating hypertension. The latter is systemically manifested by the occurrence of hot flushes. Hormonal treatment of climacteric complaints occasionally resulted in decreased vision. Fundus examination revealed macular hemorrhages in these cases. Disturbances of the vegetative vasomotor regulations are assumed to be the cause for climacteric signs, as well as the cause for acute glaucoma. (8 references)

Gunter K. von Noorden.

Witmer, R. **Treatment of retinal vein thrombosis, Experiences with a pyrogenic lipopolysaccharide (Pyrexal Wander) in combination with anticoagulants (Sintrom Geigy).** Klin. Monatsbl. f. Augenh. **134**:797-807, 1959.

The incidence of occlusion of the central retinal vein or its branches has increased in recent years. The therapy should be aimed at prevention of further thrombus formation, and lysis and canalization of an already existing thrombus. The administration of pyrexal, which activates the fibrolytic system, combined with anticoagulants appeared to be a logical therapeutic approach. Reviewing his own material, the author found that branch occlusion responded best to anticoagulants alone. Combined treatment with pyrexal did not lead to significant improvement. Occlusion of the central vein, however, which improved but little when only anticoagulants were used, responded remarkably well under combined treatment. (3 figures, 2 tables, 32 references) Gunter K. von Noorden.

12

OPTIC NERVE AND CHIASM

Ciboldi, A. **Four cases of neuropapilitis optica in the course of a virus A/I pandemic in Singapore in 1957.** Arch. di ottal. **63**:45-49, 1959.

In a pandemic of "Asiatic" influenza from A/I virus, the symptoms differed from others reported. This epidemic appeared to be "oculotropic" instead of "neurotropic." Four illustrative cases are reported in which papilledema occurred with field loss. This, with retinitis, occurred early in the disease, and was considered a neurovascular effect of the virus. Later postfebrile conjuncivitis was believed to be hypoergia, a biophysiologic response to illness. Therapy included antibiotics, cortisone, and diaphoretic. (14 references) Paul W. Miles.

Mathur, S. P. and Mathur, B. P. **Optic atrophy after smallpox.** Brit. J. Ophth. **43**: 378-379, June, 1959.

A case of secondary optic atrophy, following the eruptive stage of smallpox in a three-year-old child is reported.

Irwin E. Gaynon.

13

NEURO-OPHTHALMOLOGY

Carbajal, U. M. **Ocular findings in brain tumors in children.** A.M.A. Arch. Ophth. **61**:599-607, April, 1959.

The ocular findings in 172 children with histologically proven brain tumors are summarized and discussed; 74 percent of these children had papilledema, 50 percent abnormal fields, 33 percent nystagmus, and 28 percent had ocular muscle palsies. Less common abnormalities noted were disturbances of the pupillary reflexes, failing vision, optic atrophy, ptosis, corneal anesthesia, proptosis, lagophthalmos, Horner's syndrome, and lid lag. This latter group of abnormalities varied in frequency from 17 to 1 percent.

X-ray evidence of suture separation tends to confirm the presence of increased intracranial pressure and was present in about the same percentage of cases as papilledema. The danger of performing a spinal tap in the presence of increased intracranial pressure is stressed. At least 50 percent of the patients with ocular muscle palsies had a paralysis of the sixth nerve, the remainder had probable or definite third nerve paralysis except for the two patients who exhibited a paralysis of conjugate gaze. Nystagmus, which was noted in 59 patients, was chiefly in the horizontal plane and of the jerky type. It was observed mostly in patients with cerebellar lesions and rarely in patients with midline tumors. The differential diagnosis and course of papilledema is briefly discussed.

The author feels that the role of the ophthalmologist in the diagnosis of brain tumors is twofold: first, he should act as a consultant regarding eye findings; second, he should act as an ordinary practioner referring cases to the neurologic specialist. (15 tables, 12 references)

William S. Hagler.

de Haas, E. B. H. **Adie's syndrome.** A.M.A. Arch. Ophth. **61**:866-884, June, 1959.

The author reports the effect of dilute solutions of topical drugs on the pupillary and ciliary muscles in four patients with Adie's syndrome. Both sympathicominetic as well as parasympathicominetic drugs were found to cause more pupillary and ciliary muscle reaction in eyes with tonic pupils than in those with normal pupils. Since 2.5 percent methacholine produces rapid miosis in the tonic pupil and does not affect the normal pupil, it is valuable diagnostically. However, this same weak solution of methacholine was found to cause miosis in three cases of incomplete absolute pupillary rigidity due to syphilis.

Because the pupillary sphincter in cases of Adie's syndrome is excessively sensitive to dilute solutions of eserine and neostigmine the author cannot accept the hypothesis that this syndrome results from postganglionic parasympathetic denervation. He suggests that it may result from a primary disturbance in the region of the hypothalmic vegetative centers. (4 figures, 47 references) W.S. Hagler.

Raimondo, N. **Consideration of the arcuate scotoma in the pathology of the visual field.** Ann. d'ocul. 192:401-415, June, 1959.

The arcuate scotoma is usually thought to be the result of glaucoma or of vascular disease of the optic nerve and retina. The author demonstrates that a "relative" arcuate scotoma is demonstrable in other diseases of the optic pathways. He presents illustrative cases as follows: a patient with a lesion of the seventh cranial nerve and probable calcification of the internal carotid arteries; a diabetic with a left ptosis and paresis of the left arm; a patient with an extirpated pituitary adenoma; a paient with encephalomyelitis, and several others.

In most cases the defect is bilateral, and therefore it is believed that the lesion must be chiasmal or postchiasmal. These scotomata occur most commonly in diseases of the diencephalon and mesencephalon. One must either assume an architecture of the optic nerves and chiasm

similar to that of the retinal fibers or conclude that these relative arcuate scotomata are an exaggeration of normal angioscotomata caused by a depression of the retinal receptors. (11 figures)

David Shoch.

14

EYEBALL, ORBIT, SINUSES

Carapancea, Mihai. **The clinical and experimental mechanisms of Basedowian exophthalmos.** Ann. d'ocul. 192:200-219, March, 1959.

The author feels that the exophthalmos of Graves' disease does not have a single etiology. He finds three stages in the evolution of this syndrome: in the first there is a predominance of proptosis; the second stage is characterized by edema and hypertrophy of the contents of the orbit, and in the third stage the changes within the orbit are irreversible.

The three principal symptoms of Basedow's disease are: ocular protrusion, enlargement of the palpebral aperture, and increased tearing. The author discusses each of these symptoms and feels that the ocular protrusion is caused by a synchronous contraction of the periocular muscles, the enlargement of the palpebral aperture by a contraction of the levator of the upper lid, and the tearing by pressure on the lacrimal gland as a result of the same factors. (25 figures) David Shoch.

Ohlknecht, L. **Extrusion of an elderberry pith implant after 57 years.** Klin. Monatsbl. f. Augenh. 134:707-711, 1959.

Implants made of elderberry pith have been used in the past after enucleation. They were thought to offer good physical properties to attract ingrowth of connective tissue. In this case the implant had to be removed because the socket became irritable and inflamed after 57 years of excellent compatibility. The implant was examined histologically. Foreign body reaction and calcification were found in the superficial layers. (4 figures, 5 references)

Gunter K. von Noorden.

Scuderi, Giuseppe. **Tuberculoma of the orbit.** Gior. ital. oftal. 10:337-349, Sept.-Oct., 1957.

A case of tuberculoma of the orbit is described. The literature is reviewed and stress is laid on the problems of differential diagnosis. Treatment was by surgical removal but additional postoperative specific therapy is recommended. (5 figures, 33 references) V. Tabone.

Smith, V. H. **Malignant lymphatic tumours of the orbit.** Brit. J. Ophth. 43:247-251, April, 1959.

The author reports the data on eight patients. The difficulties inherent in classifying malignant lymphomata on a histological basis are noted. One half of the patients with extraorbital metastasis died within six months of their first visit. The patients without extraorbital extension are alive and well two to nine years later. (7 references) Irwin E. Gaynon.

Zamorani, G. **Orbital cellulitis.** Gior. ital. oftal. 10:455-461, Nov.-Dec., 1957.

A case of cellulitis of the infero-lateral wall of the orbit is described. It became apparent three months after an attack of brucellosis while the blood serum reaction was still positive. A tuberculous origin having been excluded, the author believes the cause to be the melitococcus. The rarity of this condition is emphasized. (4 figures, 2 references) V. Tabone.

15

EYELIDS, LACRIMAL APPARATUS

Arruga, H. **The use of selenium sulfide in the treatment of blepharitis.** Ann. d'ocul. 192:528-529, July, 1959.

The author uses an ointment containing 1 percent selenium sulfide, ¼ percent prednisone and ¼ percent chloramphenі-

col to treat blepharitis. This is applied nightly for one or two weeks and then once a week for two months.

David Shoch.

François, J. and Verriest, G. **A study of congenital dyschromatopsia.** Ann. d'ocul. **192**:81-120, Feb., 1959.

A man, age 28, with a particularly rare type of color vision defect is described. He sees only two colors, a "blue" which covers the range from bluish-purple to blue-green, and a "red" which covers the area from orange to reddish-purple. Yellows and purples are not seen at all. He thus falls into a group which lies somewhere between those of the clinical dichromatic system and those of typical achromatopsia. The authors then review the literature on this group of patients; they found about 50 cases. Not enough general information is available either in the literature or on the patient presented to allow logical detailed classification. From the functional point of view there is probably an infinity of types between the classical dichromatic system and typical achromatatopsia and almost each case can be made into a class of its own. David Shoch.

Garcia, F. A. and Blandford, S. E. **The use of the three tailed fascial sling with pull-out wires to correct blepharoptosis.** Plast. & Reconstruct. Surg. **23**:596-600, June, 1959.

Not all ptotic lids are best corrected by a fascial sling, but for those in which this method is indicated, the authors have applied the pull-out wire (stainless steel) principle of Bunnell, used in hand surgery.

A sector of fascia lata is shaped with a body 2 cm. wide and ¾ cm. in height with three tails, each 3 mm. wide and 4 cm. long. The tarsal plate is exposed by an incision 3 to 4 mm. above the lid margin and the body of the three-tail sling is fastened to it so that the upper half of the tarsus is covered by the body of the fascia. Three small incisions are made just above the eyebrow. With the Frackelton facial sling passer, the tails are brought deep to the orbicularis oculi and out through these incisions. A loop is then made in the end of each tail by folding back and suturing each tip of the fascia. Through this loop the pull-out wire is passed and drawn upward through the frontalis muscle with the wire making its exit through the skin in the hairline. The lid is bandaged in the closed position and on the second or third postoperative day, when the swelling begins to subside, the height of the lid margin is adjusted by loosening or tightening the attached wires. Suitable adjustments are made during the next three to seven days and the pull-out wires are not removed until three or four weeks have elapsed. The author states that this technique has been successful in a small series of cases.

Alston Callahan.

Jacobs, H. B. **Epihora due to weak lid muscles.** Brit. J. Ophth. **43**:332-339. June, 1959.

The diagnosis of weak muscles is difficult and is made after a favorable response to exercise plus the failure of other accepted methods of therapy. Lower lids that are placed below their usual level, decreased muscle tone or slightly everted puncta are useful guides. The exercise consists of 20 slow sustained winking movements made three times each day. Forceable lid closure is to be avoided. Fourteen cases are presented. (1 table, 22 references) Irwin E. Gaynon.

Marsico, V. **Late results of ablation of epithelioma of the eyelids.** Arch. di ottal. **63**:23-38, 1959.

The epitheliomas of the lids are described and classified as basal cell, spindle cell, or junctional. The basal cell epitheli-

omas may be erosive, ulcerative, globular, vegetative, sclerodermiform, or pigmented. The spindle cell epitheliomas may be diffuse, deep, nodular superficial, or kerato-acanthoma. They may be treated by electrocoagulation, X-ray, or radium, but the preferred method is surgical. In two cases, the coloboma of the eyelid was repaired with auricular cartilage. (11 references) Paul W. Miles.

Miani, Paolo. **Ectopia of the lachrymal gland.** Gior. ital. oftal. **10**:462-467, Nov.-Dec., 1957.

A case of bilateral ectopia of the palpebral portion of the lachrymal gland is described. (3 figures, 13 references)

V. Tabone.

Sinclair, Marga H. **Management of extensive malignant tumors of the eyelid.** Plast. & Reconstruct. Surg. **23**:589-595, June, 1959.

This article is of considerable interest because extensive radiation facilities are available at the M. D. Anderson Hospital and Tumor Institute as well as excellent surgical facilities. The author's experience indicates that resection of the tumor and lid reconstruction give the best results. The author reports 163 cases of malignant tumor of the eyelid, the majority of which occurred in the lower lid and 85 percent of which were basal cell carcinoma.

Electrocoagulation is condemned because no specimen is available for pathologic examination, there is no sure method of determining whether the destruction of the diseased tissue is adequate, and the resulting cicatrix can conceal persistent. and recurrent disease for long periods.

Surgical treatment by the Hughes method and its modifications is preferred to radiation because the functional and cosmetic results are good, the results are not subject to later change as in the case of radiation, the extent of the lesion can be verified by frozen section, large adjacent areas covered with skin cancers can be excised widely and repaired at the same time, and recurrences after surgical treatment are easier to manage because additional surgery or radiation can be performed; but when recurrences appear after radiation, no form of radiation can be repeated and surgical treatment then renders inferior functional and cosmetic results.

Twelve photographs of preoperative and postoperative pictures show the improvements achieved in some of the author's cases. Alston Callahan.

Straatsma, B. R. **Cystic degeneration of the Meibomian glands.** A.M.A. Arch. Ophth. **61**:918-927, June, 1959.

When the Meibomian ducts are obstructed, the glands undergo a specific type of cystic degeneration. The degeneration is characterized by a distention of the ducts as well as the secretory acini. These cystic enlargements are limited by the fibrous tissue of the tarsus and they do not elicit any inflammatory response. This lack of inflammation and granuloma formation clearly distinguishes this condition from chalazion. Regardless of whether the obstruction results from neoplastic disease, cicatrization following infection or trauma, or from surgical procedures, the histopathology is the same. (11 figures, 20 references)

W. S. Hagler.

Valiere-Vialeix, V. and Robin, A. **Surgical treatment of epitheliomas of the lower lid with immediate autoplasty.** Ann. d'ocul. **192**:434-444, June, 1959.

Although the authors recognize the advantages of X-ray therapy for epitheliomas of the lids, they feel that long-term results are just as good with surgical therapy. In areas remote from radiotherapy centers surgery is a real advantage. The

destructive effect of surgery is minimized by doing an immediate transplant, usually from the upper lid, although skin from the jugal area of the cheek may be needed. For lesions of the inner canthus a flap is usually made from skin on the lateral side of the nose. The technique is basically that of Dupuy-Dutemps except that the autotransplant is made immediately instead of as a separate procedure. (6 figures) David Shoch.

Vancea, P. and Vaighel, V. **Failures in dacryosystorhinostomy.** Ann. d'ocul. **192**: 150-155, Feb., 1959.

In the past ten years the authors have performed 400 dacrycystorhinostomies. The success rate is about 97 percent; there were only 13 reoperations. Five of these 13 patients had a narrow bony window; in three cases the sacs became sclerosed and in two a chronic ethmoiditis was the cause of the failure. The most important factor is the making of an adequate window. David Shoch.

Zanchi, Marco. **Melanoblastoma of the uvea.** Gior. ital. oftal. **10**:367-413, Sept.-Oct., 1957.

In this very interesting and fully illustrated article Zanchi describes 21 cases of melanoblastoma of the uvea. The various types and the probable etiologic factors are discussed. A classification is proposed which divides tumors into those with fusiform cells, those with epithelioid cells, and those with mixed cells. Apart from the fact that those with less pigmentation show a lesser tendency to disseminate, the type of cells does not seem to have any definite prognostic value. (22 figures, 70 references) V. Tabone.

16
TUMORS

Blaxter, P. L. and Smith, J. **Rhabdomyosarcoma of the orbit. Report of two cases.** Ophth. Soc. U. Kingdom **78**:83-97, 1958.

Rhabdomyosarcoma of the orbit usually occurs in children with an average age of seven years and with a survival rate of one and one half years. Polymorphism is characteristic of these sarcomas; the predominant cells are elongated and spindle shaped and there are giant cells with fibrils which often extend into the cytoplasm of the adjacent cell. The tumors are highly malignant, form metastases in local lymph nodes and are spread by the bloodstream. They may simulate lymphosarcoma and show a strong tendency to recurrence after surgical removal. The authors add two more cases of rhabdomyosarcoma of the orbit from the Christie Hospital in Manchester to the 33 previously recorded. They conclude that an orbital tumor in a child which biopsy shows to be a sarcoma (not lymphosarcoma) is probably a rhabdomyosarcoma. The child should have an exenteration of the orbit and irradiation for any recurrence. Beulah Cushman.

Calmettes, L., Bazex, A., Deodati, F., Dupré, A. and Bec, P. **Oculopalpebral manifestations of myelinated neuromas of the mucous membranes.** Arch. d'opht. **19**: 257-269, April-May, 1959.

The authors note that tumors of the peripheral nerves involving the lids, conjunctiva, or cornea are rare and are limited almost entirely to the manifestations of von Recklinghausen's neurofibromatosis. They report two unusual cases in young subjects having the following lesions in common: 1. Myelinated neuromas localized to the mucous membranes of the conjunctiva, lips, tongue, and palate; 2. hypertrophy of the corneal nerves; 3. constitutional anomalies, including cranial malformation and centrofacial freckle-like tumors; and 4. absence of skin, neurologic, or osseous manifestations of von Recklinghausen's disease.

The two cases are reported in detail with color plates illustrating the clinical appearance of the tumors as well as the histopathology of biopsy material. A full discussion and the essentials of differential diagnosis are presented. The similarity to von Recklinghausen's disease is noted but the lesions are believed by the authors to constitute a distinct entity. (12 figures, 43 references) P. Thygeson.

Cardell, B. S. and Starbuck, Mary J. **Diktyoma.** Brit. J. Ophth. **43**:217-224, April, 1959.

A case of diktyoma in a two-year-old child is reported. The eye was removed because of secondary glaucoma and anterior staphyloma. An annular tumor of the ciliary body was found on section. Diktyoma arises in the nonpigmented epithelium of the ciliary body. (6 figures, 26 references) Irwin E. Gaynon.

Chatterjee, B. M. **Subconjunctival lymphoma.** Brit. J. Ophth. **43**:371-375, June, 1959.

A large subconjunctival lymphoma infiltrating all the tissues of the orbit, except the globe and optic nerve, is reported. (6 figures, 15 references)
Irwin E. Gaynon.

Montauffier, Guennec and Beauchamp. **Dermo-epithelioma of Parinaud.** Arch. d'opht. **19**:25-30, Jan.-Feb., 1959.

The authors note that the dermo-epithelioma described by Parinaud in 1884 is rare, only 52 observations having been recorded in the literature up to 1936. They report an additional example in a woman of 40 years who had a tumor at the inner angle of the right eye, near the caruncle. The tumor was completely excised and on section showed a cystic neoplasm having the characteristics of the Parinaud tumor. Four photomicrographs in black and white showed the essential features of the lesion. The authors then discuss the term "dermo-epithelioma" and suggest as a substitute the term "mixed cystic tumor naevic and epithelial) of the conjunctiva." They further discuss the prognosis of this lesion and conclude that the majority fail to recur after excision. (4 figures, 18 references) P. Thygeson.

Rende, Salvatore. **Leiomyoma of the iris.** Gior. ital. oftal. **10**:299-313, July-Aug., 1957.

A case of leiomyoma of the iris is described and stress is laid on its clinical, pathologic, and therapeutic aspects. Twenty similar cases in the literature are reviewed. (4 figures, 26 references)
V. Tabone.

Spaeth, E. B. and Valdes-Dapena, A. **Hemangiopericytoma.** A.M.A. Arch. Ophth. **60**:1070-1073, Dec., 1958.

The authors report a case of this tumor occurring in the orbit of a 36-year-old man. The tumor is apparently a persistently recurring type of malignant growth. (3 figures, 5 references) G. S. Tyner.

Zita, A. **A case of choroidal spindle cell sarcoma after squamous cell carcinoma of the epiglottis.** Klin. Monatsbl. f. Augenh. **134**:886-889, 1959.

A 57-year-old patient was operated on for squamous cell carcinoma of the epiglottis. Three years later a primary spindle cell sarcoma of the choroid occurred in one eye. The differential diagnosis between pigmented choroidal tumors and metastatic carcinoma is difficult, because both lesions have a similar ophthalmoscopic appearance, and reveal identical results on scleral transillumination. (18 references)
Gunter K. von Noorden.

17
INJURIES

Abramowicz, I., Burau, J. and Wlazlowski, Z. **Removal of non-magnetic for-**

eign body under control of X-ray. Klinika Oczna **28**:433-436, 1958.

The author removed a non-magnetic intraocular foreign body with the help of two X-ray screens placed so that he could observe movements in the frontal and antero-posterior planes. After preparation of the field of entry extraction of the foreign body took only a few seconds. (3 figures, 11 references) Sylvan Brandon.

18

SYSTEMIC DISEASE AND PARASITES

Asaoka, T. **A study of Behçet's disease.** Acta Soc. Ophth. Japan **63**:50-97, 1455-1501, Jan., June, 1959.

Clinical observation of 30 cases is described in the first part. Ocular symptoms occur a certain period after the onset of the disease. In the earliest case the period was three months and in the latest 10 years; the average was 3.5 years. During the attacks there are a definite acceleration in the sedimentation rate of red cells and an intensively positive Mantoux reaction. But the disease does not respond to antituberculous chemotherapy. Bacterial and viral cultures are all negative. In one third of the cases there was an adrenocortical hypofunction. Biopsy findings of the eye are also illustrated. Perivascular edema, perivascular infiltration, and perivascular fibrinoid degeneration are common findings. (86 figures, 40 tables, 92 references) Yukihiko Mitsui.

Gordon, N. **Ocular manifestations of internal carotid artery occlusion.** Brit. J. Ophth. **43**:257-267, May, 1959.

Arteriography has shown occlusion of the internal carotid artery to be a rather common cause of cerebral symptoms of which blindness of the eye on the side of the occlusion is a frequent one. The occurrence of transient or permanent blindness in the very early stages of the disease is important in the early recognition of the arterial occlusion. If the presence of a carotid occlusion can be demonstrated before it becomes complete, new techniques in arterial surgery have made it possible to remove the obstruction and to restore normal blood flow. The two most common ocular signs of this disease are blindness of the homolateral eye and hemianopic field defects; the blindness may be transient or permanent. If the occlusion remains confined to the origin of the ophthalmic artery, then collateral circulation from the external carotid may suffice to maintain circulation to the eye which explains the transient nature in some cases. However, if both internal and external carotids are blocked or if an embolus arises at the site of the internal carotid lesion in the neck and blocks the ophthalmic artery, then blindness of the ipsilateral eye will be permanent. Homonymous hemianopsia is most frequent in thrombosis of the internal carotid and this may be transient but most frequently is permanent. It is due to obstruction of the middle cerebral artery which serves the optic radiation.

The incidence of ocular signs and symptoms is analysed in 50 patients with occlusion of the internal carotid artery. The diagnosis was confirmed by angiography or surgical exploration. Ten of these cases are presented in some detail. (19 references) Morris Kaplan.

Hayden, R. and Grossman, M. **Rectal, ocular and submaxillary pain; a familial autonomic disorder related to proctalgia fugax; report of a family.** A.M.A. J. Dis. Child. **97**:479-482, April, 1959.

This is an unusual hereditary, idiopathic, presumably autonomic syndrome characterized by brief episodes of excruciating pain associated with flushing of the buttocks and legs, ocular pain and flushing of the eyelid and periorbital skin, and submaxillary pain. A father and son were

examined and their family tree studied. (1 figure, 7 references)

Frederick C. Blodi.

Hockin, R. L., Sampson, V. E. and Sutherland, J. M. **Bilateral loss of vision complicating mitral stenosis.** M.J. Australia **2**:185-187, 1959.

A man, aged 48 years, presented himself with sudden loss of vision, giddiness, vomiting and some confusion. The lesion was considered to be an embolus due to mitral stenosis and auricular fibrillation which lodged at the bifurcation of the basilar artery. Anticoagulant therapy coincided with considerable improvement, the final defect being a homonymous hemianopia. (3 figures, 11 references)

Ronald Lowe.

Kaufman, H. E. **Primary familial amyloidosis.** A.M.A. Arch. Ophth. **60**:1036-1043, Dec., 1958.

The author reports three cases of this rare systemic disease of protean manifestations. A review of the literature is included. The diagnosis is best established by biopsy of affected tissue. Ocular signs, including vitreous opacities and widespread hemorrhagic effects in the ocular structures, occur in about 8.4 percent of cases. (2 figures, 61 references)

G. S. Tyner.

Parsons-Smith, G. **Sudden blindness in cranial arteritis.** Brit. J. Ophth. **43**:204-216, April, 1959.

ACTH is considered the most suitable therapeutic hormone because of the advanced age in which this disease occurs. It should be given as soon as possible. There may be an associated thrombosis of the central retinal artery, retrobulbar neuritis, or papilledema. ACTH given on the same day as blindness occurs has restored sight in every patient treated. Inasmuch as the eye findings may antedate the cranial arteritis, it is recommended that all occlusive blood vessel incidents of the retina and optic nerve in elderly people be treated with ACTH for a period of 21 to 28 days, if a therapeutic response ensues. If there is no improvement treatment may be discontinued after a week's trial. (3 figures, 7 references)

Irwin E. Gaynon.

Pittenger, B. N. **Ocular myiasis caused by Oestrus ovis.** A.M.A. Arch. Ophth. **60**:1107-1108, Dec., 1958.

A practical point in this discussion is that the larvae are not easily removed from the conjunctiva unless 5-percent cocaine is used. Apparently the larvae are not affected by pontocaine or similar topical anesthetics. (3 references)

G. S. Tyner.

Vergez, A. **A rare ocular syndrome following spontaneous carotid thrombosis.** Ann. d'ocul. **192**:376-384, May, 1959.

The author describes a 69-year-old woman who had a right hemiplegia and right hemianopsia. The next day she noted an acute onset of pain, loss of vision, tearing and hypotony of the left eye. The pupil was dilated and fixed and the vitreous hazy. In several days the vitreous cleared and many hemorrhages and an atrophic nerve head were visible. Gradually all symptoms subsided, but the pupil remained dilated and the eye blind. The author believes that this is a rare instance of thrombosis of the internal carotid associated with a thrombosis of the ophthalmic artery. The disappearance of symptoms is ascribed to the development of compensatory circulation primarily through the external carotid artery. (7 references)

David Shoch.

19

CONGENITAL DEFORMITIES, HEREDITY

Correa Netto, O. **The eyes and albinism.** Arq. brasil. de oftal. **21**:364-373, 1958.

Albinism may be complete or partial

and is found in all races and in animals. It is observed more frequently in tropical zones, and, judging from the literature, occurs more frequently in females. However, the author has observed eight cases, all in males. All of his patients had hyperopia, again in contrast to the literature which reports a higher incidence of myopia. The albino does not have a congenital weakness of the retina, having no defect in color perception or dark adaptation. Vitamin deficiency does not play a role in the visual difficulty. Tinted lenses are recommended for the albino.

It is theoretically possible that albinism has a diencephalic-hypophyseal origin, although therapy with melanophoric or pituitary hormones has not improved visual acuity. Since the disorder is hereditary and favored by consanguinity, albinos should not intermarry. The author feels that Daltonism has a greater impact upon society than albinism. (11 references) James W. Brennan.

Garland, M. A. and Singer, R. L. **Posterior embryotoxon associated with slit-like pupil and corectopia.** A.M.A. Arch. Ophth. **60**:1104-1106, Dec., 1958.

The authors report a case in a five-month-old Negro boy. There was no accompanying glaucoma. (4 figures, 6 references) G. S. Tyner.

Keerl, G. **A study of heredity of floriform cataract.** Klin. Monatsbl. f. Augenh. **134**:680-686, 1959.

A dominant hereditary pattern was observed in three generations. The youngest patient affected was two years old. This is in contrast to the findings of Koby, who described this condition for the first time, and as not occurring before the age of ten years. Involvement of the embryonic structures of the lens leads to the conclusion that floriform cataract is a disease of a hereditary, congenital, and progressive type. The diagnosis in infants can be made by the characteristic configuration of the lenticular opacity seen with the ophthalmoscope. (2 figures, 8 references) Gunter K. von Noorden.

Linsday, A. **Arterial anomaly at the optic disc.** Brit. J. Ophth. **43**:312-313, May, 1959.

In an otherwise normal fundus an anomalous artery crossed the disk: the blood in it oscillated. This movement could be stopped by pressure on the eye. The artery was probably derived from an artery in the orbit rather than from one of the intraocular vessels. (1 figure) Morris Kaplan.

Prado, D. **Phakomatoses.** Arq. brasil. de oftal. **21**:327-334, 1958.

There are four entities of associated tumors which affect the visual apparatus and are classified under the title of phakomatoses. They tend to be hereditary, have psychic and mental degenerative components, and are almost entirely resistant to therapy. In addition, there may be osseous or cutaneous manifestations which may be generalized.

Tuberous sclerosis (Bourneville's disease) is characterized by epilepsy, mental deterioration, neurological signs, skin changes and the retinal lesions which are glioneuromas. These may be single or multiple and grow slowly, resembling a mulberry. They tend to be flat and light yellow in color. Other organs may show tumor formation, chiefly the kidney.

Neurofibromatosis (Von Recklinghausen's disease) is well known through its cutaneous manifestations—superficial nodules, cafe-au-lait spots and hypertrophy of the skin. The lids are often involved in this hypertrophy. Orbital tumors occur frequently. Nodules may be found in the conjunctiva and uvea. Retinal lesions have been observed, but there is no agreement that they are a part of the syndrome. The tumors are radioresistant

and tend to recur slowly after extirpation.

Angiomatosis (von Hippel-Lindau's disease) is a rare condition whose cause is unknown. The retinal lesions are characterized by extreme dilatation of the vessels which tend to form a tumor. Exudate is also present. Similar vascular lesions occur within the nervous system, mainly the cerebellum. Papilledema is frequent. Early diagnosis is difficult because of the peripheral location of the lesions.

Sturge-Weber's disease is characterized by facial naevus, glaucoma and intracranial calcification. Convulsive seizures occur with mental deficiency. The glaucoma is the result of a choroidal angioma. When this occurs early in life, buphthalmos appears. In later life, the glaucoma is progressive, resembling chronic simple glaucoma. In general the appearance of the retina is found to be normal in ophthalmoscopy. Treatment of the glaucoma is not successful in most instances. (5 references) James W. Brennan.

Renard, G. and Desvignes, P. **Familial angiomatosis.** Arch. d'opht. **19**:121-125, March, 1959.

The authors discuss von Hippel's disease, its variations, its familial nature, and its relation to the syndromes of Lindau and Sturge-Krabbe-Weber. They note that Bonnet, Blanc, and Dechaume have described a syndrome combining a retinal angioma with a cerebral aneurysm and with aneurysms on the face. They report the case of a 16-year-old boy with reduced vision of the left eye associated with angiomatosis and gliosis, and with pure angiomatosis in the right eye. The familial nature of the affection was demonstrated by the finding of retinal angiomatosis in three members of the family. One member had epileptic attacks associated with cerebral angiomatosis; another had a gastric tumor, as described in connection with the Sturge-Krabbe-Weber syndrome.

The article concludes with a survey of the literature and with a full discussion of the interrelationships of the various syndromes, including the phacomatoses. The case report is illustrated with three fundus drawings in color. (3 figures, 26 references) P. Thygeson.

Rieger, H. **Congenital toxoplasmosis and twin pregnancy.** Klin. Monatsbl. f. Augenh. **134**:862-871, 1959.

The literature reveals a prevalence of toxoplasmosis occurring in twins. The case of a mother and her fraternal twin girls is reported. Mother and both daughters showed a moderately positive serologic reaction for toxoplasmosis. Manifestations of the disease, however, were only found in one child who had marked fundus changes. A review of the literature indicates that the features of toxoplasmosis are more similar in identical twins than in fraternal ones. It is assumed that toxoplasma not only gives rise to inflammatory lesions of the fetal tissues (fetopathy), but may produce typical malformations of brain and eye in an even earlier developmental stage (embryopathy, blastopathy) by its toxic action. (1 table, 43 references) Gunter K. von Noorden.

Wollensak, J. **Characteristic ocular findings in Bloch Sulzberger's syndrome (incontinentia pigmenti).** Klin. Monatsbl. f. Augenh. **134**:692-704, 1959.

The cardinal symptoms of incontinentia pigmenti consist of: characteristic skin pigmentation, frequent and variable ocular anomalies, missing or malformed teeth, and alopecia (type Brocq). Females seem to be predominantly involved. The author reviews 175 cases from the literature. The eyes were involved in 26 percent of the cases, mainly with various clinical manifestations of fetal uveitis, or uveitis of the newborn or infant. The changes ranged from pseudoglioma to more distinct lesions which can be diagnosed only by slitlamp examination or by ophthalmoscopy.

A case in a six-year-old girl is reported. She had bilateral fetal uveitis clinically

manifested as a pseudoglioma of the persistent, hyperplastic primary vitreous type. Papillitis and postneuritic or simple optic atrophy have been found to occur with incontinentia pigmenti. Pathogenetically these manifestations can be considered to result from the same inflammatory processes which also are the cause of the uveitis. Comitant strabismus has been reported present in twice as many patients with this disease as in a group of average population. Organic brain damage is thought to be the cause of it. More information regarding ocular involvement and genetic pattern should be obtained by adequate ophthalmologic examination and a careful history. (4 figures, 149 references) Gunter K. von Noorden.

Taylor, P. J., Coates, T. and Newhouse, M. L. **Episkopi blindness. Hereditary blindness in a Greek Cypriot family.** Brit. J. Ophth. **43**:340-344, June, 1959.

The authors describe a recessive familial blindness affecting 16 of 38 males. The disease is transmitted through the female to about half of the males. The eyes are usually normal at birth. The disease is first observed at about the age of six weeks. Of the 17 females in the family who had male children, 13 have transmitted the defect. The findings include corneal dystrophies, cataracts, retrolental lesions and retinitis pigmentosa. (2 figures, 1 table, 1 reference)

Irwin E. Gaynon.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Bailliart, P. **The causes of blindness in 1958 at the National Institute for Blind Children in Paris.** Ann. d'ocul. **192**:362-366. May, 1959.

Several causes of blindness in children have been eradicated in recent years, among them neo-natal ophthalmia and interstitial keratitis. Iritis and uveitis as a cause of blindness have also been markedly reduced. On the other hand, retrolental fibroplasia now is the cause of three percent of blindness and glioma of five percent. Retinal degenerations cause seven to eight percent but the largest groups are those children with congenital glaucoma (25 percent and congenital cataract (23 percent). Trauma still causes four percent of blindness. David Shoch.

Da Silva, J. R. **Preventive ophthalmology.** Arq. brasil. de oftal. **21**:374-383, 1958.

The late Park Lewis said that the prevention of blindness depends upon three factors—the ophthalmologist who understands the problem, the public who should learn to know it, and the public health agencies which safeguard the public health. The author believes that not only the opthalmologist, but the pediatrician, internist, dermatologist, syphilographer and other medical specialists should be concerned with the conservation of vision. In addition, those in industry, labor, fields of education, and parents can be of great aid in this program of preventing blindness.

Various diseases seen by physicians in other fields are discussed briefly with their ocular complications. The article concludes with mention of some phases of ocular hygiene. (8 references)

James W. Brennan.

Orlowski, Witold J. **Polish ophthalmic bibliography for 1957.** Klinika Oczna **28**: 437-440, 1958.

The author presents 85 titles of papers on ophthalmologic subjects which appeared in various medical periodicals in Poland during 1957. Papers in the Klinika Oczna are not included.

Sylvan Brandon.

Tower, P. **George Frick.** A.M.A. Arch. Ophth. **60**:989-994, Dec., 1958.

The work and interests of George Frick are described and discussed. (2 figures, 15 references) G. S. Tyner.

NEWS ITEMS

EDITED BY DONALD J. LYLE, M.D.
411 Oak Street, Cincinnati 19, Ohio

News items should reach the editor by the 10th of the month. For adequate publicity, notice of postgraduate courses and meetings should be received three months in advance.

ANNOUNCEMENTS

FIGHT FOR SIGHT AWARDS

The National Council to Combat Blindness, Inc., announces 1959 Fight for Sight awards to medical colleges, hospitals, research centers and individual investigators totaling $160,000. These awards include 26 grants-in-aid, eight postdoctoral fellowships, two predoctoral fellowships, 20 summer student fellowships and three awards in support of clinical service projects.

Fight for Sight grants-in-aid and full-time research fellowships are generally awarded for a period of one year and may be renewed with the approval of the National Council to Combat Blindness' Scientific Advisory Committee.

The organization announces an increase in its stipend allowance for research fellowships. Formerly the stipend range was $2,400.00 to $5,000.00 per year. The newly established range is from $3,600.00 to $7,500.00. Student fellowship stipends have also been increased with the maximum allowance now set at $300.00 per month. Student fellowships are awarded for a two or three-month period.

January 1, 1960, has been designated as the closing date for receipt of applications for the 1960-61 group of awards from applicants not requesting renewal support. Applicants (other than those filing for student fellowships) who wish to apply for continuation support are requested to file no later than March 15th. Appropriate forms may be obtained by addressing: Secretary, National Council to Combat Blindness, Inc., 41 West 57th Street, New York 19, New York.

Seven additional members have joined the Scientific Advisory Committee of the organization: Hermann M. Burian, M.D., professor, Department of Ophthalmology, State University of Iowa, College of Medicine, Iowa City; W. Morton Grant, M.D., associate professor of ophthalmology, Massachusetts Eye and Ear Infirmary, Harvard Medical School, Cambridge; V. Everett Kinsey, Ph.D., assistant director of research, Kresge Eye Institute, Detroit; John McLean, M.D., chief, Department of Ophthalmology, New York Hospital-Cornell Medical Center, New York; Edward W. Norton, M.D., chairman, Department of Ophthalmology, University of Miami School of Medicine, Miami, Florida; George K. Smelser, Ph.D., Department of Ophthalmology, Columbia University College of Physicians and Surgeons, New York; and Bradley R. Straatsma, chief, Division of Ophthalmology, Department of Surgery, University of California Medical Center School of Medicine, Los Angeles.

Other members of the committee are: Charles A. Perera, M.D., New York, chairman; James H. Allen, M.D., New Orleans; Bernard Becker, M.D., Saint Louis; Frederick Crescitelli, Ph.D., University of California; Arthur G. DeVoe, M.D., New York; Dan M. Gordon, M.D., New York; Charles Haig, Ph.D., New York; Michael J. Hogan, M.D., San Francisco; Peter C. Kronfeld, M.D., Chicago; Irving H. Leopold, M.D., Philadelphia; A. E. Maumenee, M.D., Baltimore; Stuart Mudd, M.D., Philadelphia; Frank Newell, M.D., Chicago; Theodore C. Ruch, Ph.D., Seattle; Samuel L. Saltzman, M.D., New York; Kenneth C. Swan, M.D., Portland, Oregon; Phillips Thygeson, M.D., San Francisco.

PAN-AMERICAN CONGRESS MEETING IN NEW YORK

The Institute of Ophthalmology of the Americas will conduct a post Pan-American congress meeting at the New York Eye and Ear Infirmary February 9 to 17, 1960. Each symposium will be composed of two Latin-American ophthalmologists and two Infirmary staff members. The meetings, with the exception of the last day's, start at 10:00 A.M. The schedule is:

Tuesday, February 9th, "Cataracts"; Wednesday, February 10th "Retinal detachment"; Thursday, February 11th, "Muscle anomalies"; Friday, February 12th, "Glaucoma"; Saturday, February 13th, "Uveitis"; Monday, February 15th, "Keratectomies and keratoplasties"; Tuesday, February 16th, "Pleoptics and macular function testing."

On Wednesday, February 17th, the surgical demonstrations on television begin at 9:00 A.M. and continue to 5:00 P.M.

Invitations to attend may be obtained by writing to Mrs. Tamar Weber, Registrar, Institute of Ophthalmology of the Americas, New York Eye and Ear Infirmary, 218 Second Avenue, New York 3, New York.

EMORY POSTGRADUATE COURSE

The Department of Ophthalmology of the Emory University School of Medicine announces a postgraduate course in "Applied ophthalmic pathology," on December 3rd and 4th, at the Grady Memorial Hospital, Atlanta, Georgia. The guest lecturers will be Dr. Lorenz Zimmerman of the Armed Forces Institute of Pathology, Washington, D.C., Dr. T. E. Sanders of Washington University, Saint Louis, Dr. J. A. C. Wadsworth of Columbia-Presbyterian

Medical Center, New York, and Dr. J. T. Godwin of Atlanta, Georgia.

Wills clinical conference

The 12th annual clinical conference of the staff and Society of Ex-Residents of Wills Eye Hospital will be held on February 18, 19, and 20, 1960. There will be clinic and hospital rounds held on Thursday morning and special surgical clinics in the afternoon. On Thursday evening, February 18th, there will be a scientific meeting of the Section on Ophthalmology of the College of Physicians of Philadelphia which will be preceded by dinner. Dr. Levon K. Garron of California will be the guest speaker.

On Friday and Saturday, the scientific program will include individual presentations and color television surgery, clinical, surgical and research subjects. The Arthur J. Bedell Lecture will be delivered by Dr. Peter C. Kronfeld of Chicago on Saturday morning.

An informal reception will be held on Friday evening, February 19th, for all those who attend. The conference will be concluded by a dinner meeting of the Society of Ex-Residents on Saturday evening.

Stanford postgraduate conference

Stanford Hospital, San Francisco, will present the annual postgraduate conference in ophthalmology from Monday, March 21, through Friday, March 25, 1960. Registration will be open to physicians who limit their practice to the treatment of diseases of the eye, or the eye, ear, nose, and throat. In order to allow free discussion by members of the conference, registration will be limited to 30 physicians.

Instructors will be Drs. Dohrmann K. Pischel, Jerome Bettman, Max Fine, Earle H. McBain, and Arthur Jampolsky.

Programs and further information may be obtained from the superintendent, Stanford Hospital, 2351 Clay Street, San Francisco 15, California.

Gill spring congress

The Gill Memorial Eye, Ear and Throat Hospital, Roanoke, Virginia, announces its 33rd annual spring congress in ophthalmology and otolaryngology from April 4 through April 9, 1960. The guest speakers will be: Drs. Leonard Apt, Philadelphia; William F. Barry, Jr., Durham, North Carolina; Francis B. Catlin, Baltimore; James E. Crushore, Detroit; John F. Daly, New York; Edward A. Dunlap, New York; John A. Dyer, Rochester, Minnesota; Ben S. Fine, Washington, D.C.; John R. Heller, Bethesda, Maryland; John W. Henderson, Ann Arbor, Michigan; William H. Kaufman, Roanoke, Virginia; Alexander McCausland, Roanoke, Virginia; P. Robb McDonald, Philadelphia; Franklin B. McKechnie, Richmond; Alton Ochsner, New Orleans; George E. Shambaugh, Jr., Chicago; Harvey E. Thorpe, Pittsburgh.

For further information write: Superintendent, P.O. Box 1789, Roanoke, Virginia.

California postgraduate course

On December 3rd, 4th, and 5th a postgraduate course on recent advances in external diseases of the eye will be held at the University of California Medical Center, San Francisco. Dr. Phillips Thygeson is program chairman and Dr. Michael J. Hogan, conference chairman.

Dr. Georgiana Dvorak Theobald, emeritus associate professor of ophthalmology, and consultant in clinical pathology, University of Illinois, Chicago, will give the 14th Proctor Lecture on the evening of December 4th. The title of the lecture will be "The limbal area: With particular reference to the trabecular meshwork in health and disease."

Miscellaneous

Heads ophthalmology at California

Dr. Michael J. Hogan has been appointed chairman of the Department of Ophthalmology, University of California Medical Center, to succeed Dr. Frederick C. Cordes. Dr. Hogan has been vice chairman of the department since 1952.

Born at Kemmerer, Wyoming, August 26, 1907, Dr. Hogan was graduated from the University of Utah in 1930, and received the doctor of medicine degree from Cornell University Medical School in 1932. He interned at Paterson General Hospital, Paterson, New Jersey, and was resident surgeon at Bellevue Hospital, New York. In 1935 he entered private practice in San Diego, California, but left in 1938 to take a residency in ophthalmology at the University of California Hospital. After completing his residency he did research work at Illinois Eye and Ear Infirmary, Chicago, and Columbia University, New York. He was instructor in ophthalmology, University of California Medical School from 1941-1943. Dr. Hogan served as a lieutenant in the United States Navy from 1943 to 1946.

Returning from service in 1946, Dr. Hogan became assistant clinical professor of ophthalmology, University of California Medical School; associate clinical professor and clinical director of the Francis I. Proctor Foundation, 1948-1951; clinical professor and director of the Francis I. Proctor Foundation, 1951-1957; professor of ophthalmology and director of the Francis I. Proctor Foundation, 1957-1959.

Dr. Hogan is a member of the American Board of Ophthalmology, the American Ophthalmological Society, the American Medical Association, the Ophthalmic Pathology Club, and the Pacific Coast Oto-Ophthalmological Society. He is chairman of the Pathology Committee of the American Academy of Ophthalmology and Otolaryngology, a trustee of the Association for Research in Ophthalmology, a member of the editorial board of the *A.M.A. Archives of Ophthalmology*, a consultant of the National Society for the Prevention of Blindness, and a member of the Scientific Advisory Committee of the National Council to Combat Blindness.

Correction

Owing to a typographical error in the 1958 *Transactions* of the Section on Ophthalmology of the American Medical Association, the name of Arthur J. Bedell, Albany, New York, was not included in the list of the recipients of the gold medal known as "The Prize in Ophthalmology." Dr. Bedell received this award in 1952 and proper credit is hereby given him.

Arkansas postgraduate course

On September 26, 1959, the first postgraduate ophthalmology meeting was held at the University of Arkansas Medical Center. Dr. Alston Callahan of Birmingham, Alabama, and Dr. Albert Lemoine of Kansas City, Kansas, were the guest speakers. Dr. Callahan spoke on "The use of alpha chymotrypsin in cataract surgery" and "Plastic procedures for the ophthalmic surgeon." Dr. Lemoine discussed "Differential diagnosis of macular lesions" and "Management of retinal separation." Members of the staff of the University ophthalmology department also gave talks.

Western section meeting

The Western Section of the Association for Research in Ophthalmology met at the University of California Medical Center, San Francisco, on November 19th and 20th. Dr. Daniel G. Vaughan, San Jose, California, is secretary of the section.

Course on gonioanatomy

A course on practical gonioanatomy was given at the University of California Medical Center, San Francisco, on November 12th, 13th, and 14th. Two world authorities in microscopy, Dr. Lorenz Zimmerman, of the Armed Forces Institute of Pathology, Washington, D.C., and Dr. Åke Holmberg, of Sweden, were guest speakers. Staff members participating included Drs. William Ferguson, Levon K. Garron, David O. Harrington, Michael J. Hogan, Earle McBain, William K. McEwen, William Ridgway, Ariah Schwartz, Robert N. Shaffer, William H. Spencer, Robert Tour, William van Herick, and Daniel G. Vaughan.

Societies

American College of Surgeons

On Thursday, October 1st, during the 45th annual clinical congress of the American College of Surgeons, Atlantic City, New Jersey, the Section on Ophthalmic Surgery held a joint session with the Ophthalmology Section of the New Jersey Academy of Ophthalmology and Otolaryngology. Co-chairmen of the meeting were Dr. Louis A. Amdur, Jersey City, and Dr. William B. Clark, New Orleans, who served as moderator for the symposiums on:

"Recent advances in cataract extraction," Dr. John M. McLean, New York, panelist; "Evaluation of current techniques in retinal detachment surgery," A. D. Ruedemann, Detroit, panelist; "Current concepts in the management of malignancies the eye, orbit and adnexa," Dr. Algernon B. Reese, New York, panelist; "Present status of keratoplasty," Dr. R. Townley Paton, New York, panelist.

Colorado society

The opthalmologists of Colorado Springs were hosts at the meeting of the Colorado Ophthalmological Society September 26th. Guest speaker was Dr. Bernard Becker, Saint Louis. He spoke on "Recent advances in the medical therapy of glaucoma."

Long Island society

Officers of the Long Island Ophthalmological Society are: President, Dr. Arthur E. Merz; vice president, Dr. Jesse J. Michaelson; secretary-treasurer, Dr. John R. Roche; assistant secretary-treasurer, Dr. William L. Donnelly; members of the council, Dr. Eugene T. Buckley and Dr. Harry McGrath.

United Kingdom meeting

The annual congress of the Ophthalmological Society of the United Kingdom will be held at the Royal Society of Medicine, 1 Wimpole Street, London W.1, on March 31 and April 1 and 2, 1960. The subject for discussion will be "The problem of the visually defective infant," and Mr. Frank W. Law and Dr. Ronald MacKeith will be openers. In addition there will be a symposium on "The management of hormonal exophthalmos," the speakers being Mr. T. Keith Lyle, Mr. H. B. Stallard, Mr. Murray Falconer and Dr. John Lister. Because of the difficulty in obtaining hotel accommodations in London, all members are advised to make reservations in good time.

Personal

Dr. Bertha A. Klien has been appointed professor of ophthalmology in the Department of Surgery of the University of Chicago School of Medicine, where she has been associate professor of ophthalmology at the University since 1955.

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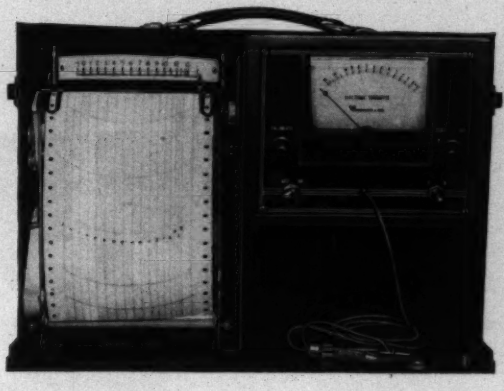

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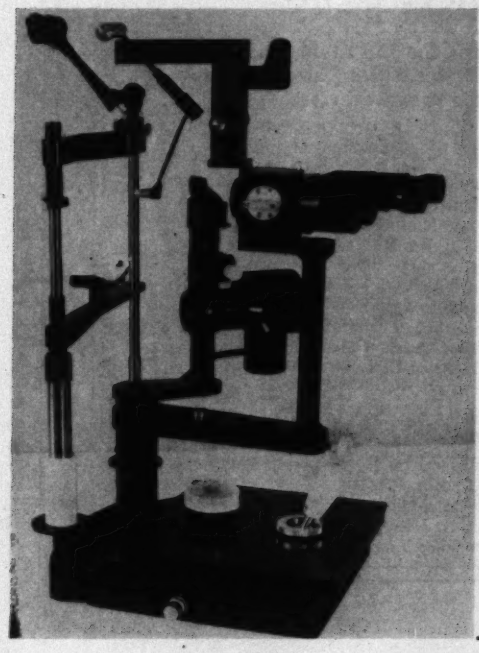

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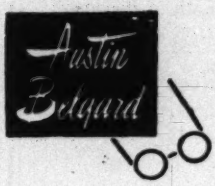

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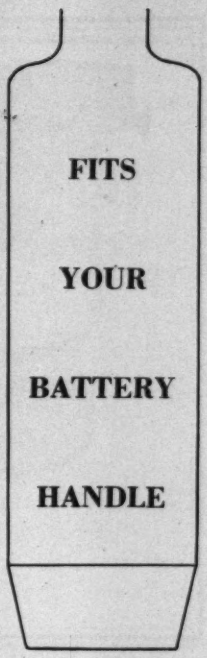

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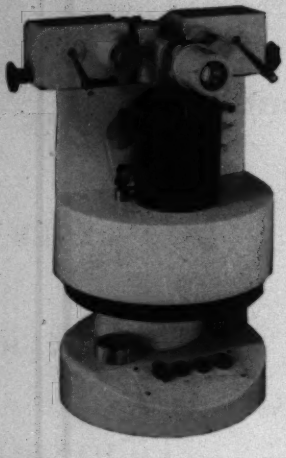

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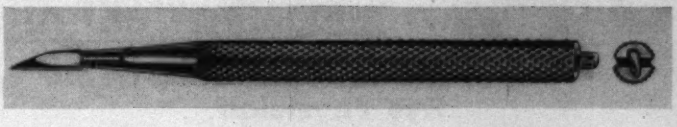

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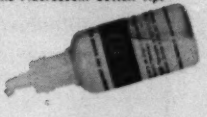

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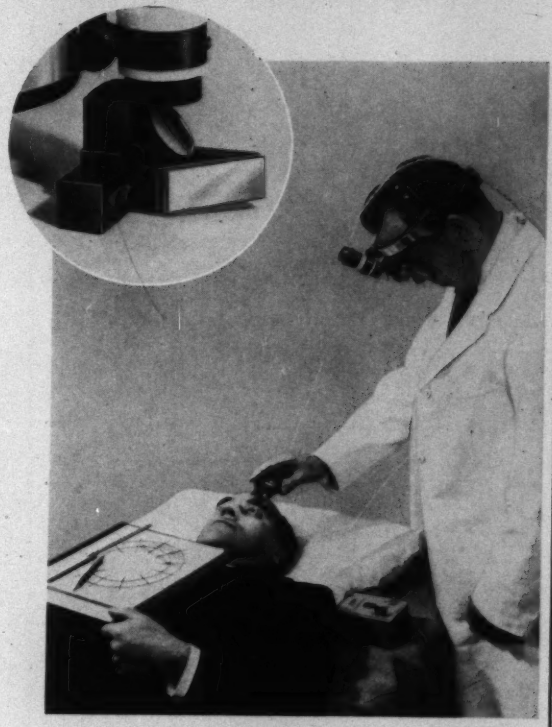

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